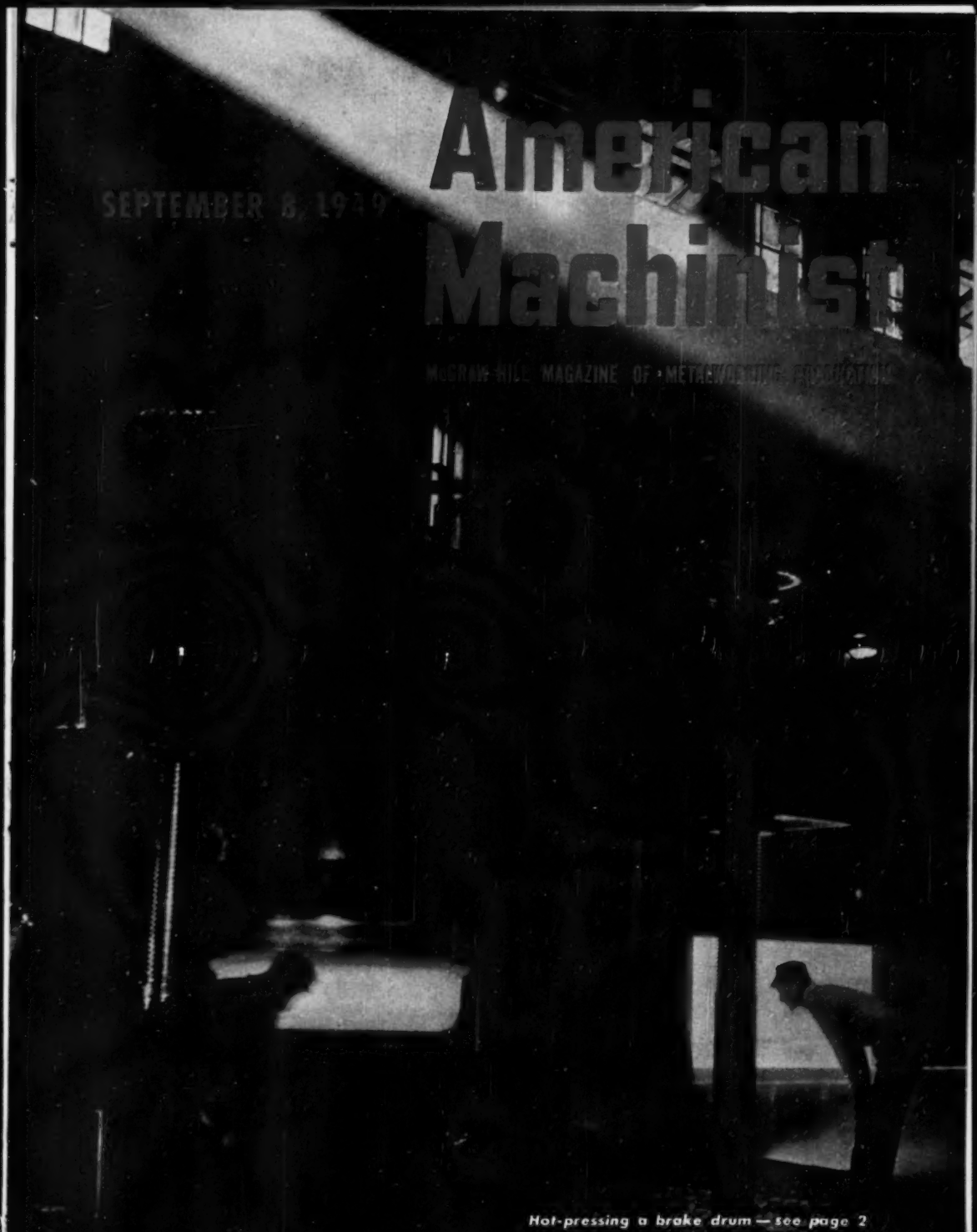
SEPTEMBER 8, 1949

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Hot-pressing a brake drum — see page 2

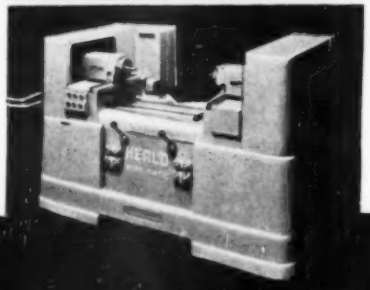
HOW TO CUT COSTS • RAILROAD APPRENTICE TRAINING

Still another automotive manufacturer

FINDS NEW WAYS TO CUT COSTS

by BORIZING

THIS PART, an automobile water-pump body, is bored, faced, grooved and chamfered all in one operation...



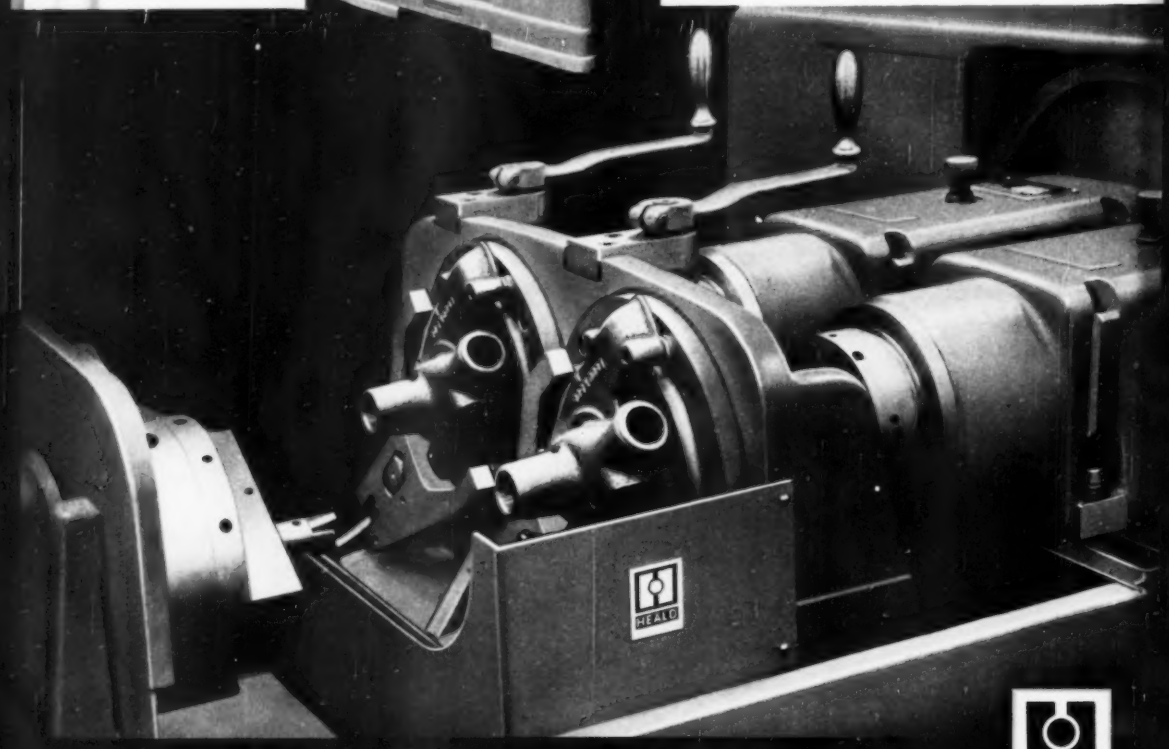
ON THIS MACHINE, a Heald Model 322 double-end Bore-Matic. Multiple tooling and clamping fixture shown below.

A single Heald Bore-Matic now does the work of two other machines, for finishing water pump bodies

Here's an example of how Borizing created a two-way saving for this automotive manufacturer — both on production cost and on capital investment.

Water pump bodies that used to require separate operations on two different machines are now finished two at a time, on a single Heald Model 322 Bore-Matic. With one set-up, and in one high-speed, automatic cycle, they are bored, faced, chamfered and grooved much faster than before, and with better finish and higher accuracy.

Why not ask your nearest Heald representative to show you how Borizing can improve your production picture? We'll be glad to help you.



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HEALD

American Machinist

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CONTENTS for SEPTEMBER 8, 1949

VOL. 93 NO. 18

Cover.....*Operation pictured is described on page 2*

ADMINISTRATION

Editorial.....*Burnham Finney* 87
Do Machine Tools Cost Too Much?.....*E. J. Tangerman* 89
Apprentices for Tomorrow's RR Shops.....*E. J. Tangerman* 100
Excuse Me, Please.....*Round Table* 123
Danger—No Smoking..... 125

SPECIAL REPORT

Industry Needs Accelerated Depreciation.....*Burnham Finney* 105

ASSEMBLY

Locating Pins Shift to Release Welded Assemblies..*H. G. Frommer* 124
Turret Fixture Assembles Stem to Valve.....*Theodore A. Nienast* 125

ENGINEERING

How to Choose and Use Portable Tools—9.....*H. P. Bailey* 113
Motor Rotors Can Be Die-Cast..... 116
New Reamer Standards.....*(RBS)* 139

FINISHING

Vaporized Metals Coat Surfaces.....*Jerome L. Bleiweis* 118
Protective Coatings for Steel by Sementation Process.....*(RBS)* 143

MATERIAL CUTTING, FORMING

Air Presses Punch Instrument Components.....*John A. Muir* 98
Taper Adapter Holds Part and Micrometer....*Stanley R. Welling* 126
End-Drilled Capscrews Resist Shock Loads Better.....*Ray Cafiero* 126
Simple Fixture Holds Small Parts for Grinding.....*Roger Isetts* 127
Thimbles Seal Adding Machines.....*R. Mery* 128
Combination Tool Cuts Off and Turns.....*H. G. Frommer* 128

TOOLING

How to Design Small Piercing Punches.....*J. R. Paquin* 93
Shop Shots at I B M..... 96
Drillpress and Lathe Combined into Jig Borer....*Lowell F. Stull* 124
Notches Hold Vise Handle.....*R. A. Lachmann* 124
Angle Dresser Features Dovetailed Slide.....*Allan B. Nixon* 125
Stepped Plug and Shims Help Pre-set Steadyrest.....*Ray Cafiero* 125
Set of Riser Clamps Simplifies Milling Setups....*Allan B. Nixon* 126
Grease Lubricates Dead Tailstock Centers.....*A. Vetsch* 127
Miniature Clamp Is Held in Bench Vise.....*Daniel H. Spofford* 127
Elbow Parallel Grips Odd-Shaped Parts.....*Gerhard Wenke* 128
Knife-Edged Web Locates Centerpunch on Layout..*R. A. Lachmann* 128

NEWS OF METALWORKING

Spot News..... 83
Gaging Metalworking..... 84
Detroit News..... 135
Names in the News.....136-194
Calendar of Events..... 204

DEPARTMENTS

Reference Book Sheets..... 139
Talking Shop..... 145
Equipment, Materials, Parts 146
Round Table Discussions.... 166
New Books..... 190

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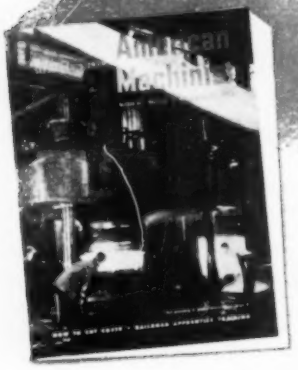


Chips and QUIPS

Our Cover . . . Largest and heaviest thus far produced at the Coatesville, Pa., plant of By-Products Steel Co., a division of Lukens Steel Company, these brake drums are 5 ft 4½ in. OD and 1½ in. thick. They are for installation in drawworks of oil-drilling rigs designed and built by Emsco Derrick & Equipment Company, Los Angeles. Weighing about a ton each, the drums are a special type of flanged and flared head. To meet exacting specifications, two separate sets of dies were made, one for pressing, the other for attaining desired bottom flatness. Both operations are done hot.

Costs . . . How can we cut production costs? Labor? No dice. Equipment? Costs too much . . . But does it? Just to check, we've done some case-studying. And we've found that present machine tools are, as we suspected, more than worth getting. Here are examples—from 60 years ago to yesterday, compared with today—and facts and figures you can use to relax the moneybags. After all, when new tools can save their cost in a year or so, how can a smart treasurer refuse? See "Do Machine Tools Cost Too Much?"

Apprenticeship . . . The hard days of the Thirties and the war days of the Early Forties raised hob with apprentice programs all over the U. S. We've pointed out the need before, provided a Special Report and several case studies. Now we've turned to the railroads, which have for years been leaders in the apprentice program. In this issue are the programs followed by the New York Central and the Union Pacific, with details. You can do the same.

Depreciation . . . A couple of years ago, we had a Special Report on depreciation rates. Now the situation is, if anything, more favorable because consumption curves have turned down, and Washington seeks a solution. So we have made an international survey, present facts and figures to show how and why U.S. depreciation rates on capital goods are too low. New equipment could cut costs and reduce prices; reduced prices would help those consumption curves. But the place to start is with the rates. Our current Special Report gives the problem, and the answers—plus comparisons with practices in other countries.

Tooling . . . Bearing in mind the desire of many readers for latest tooling information, we've got in this issue our usual wealth of such articles . . . One deals with design of small piercing punches, another with air presses in use at Sangamo Electric, another with special jobs of International Business Machines, still another with the method of die-casting motor rotors. Then there are five packed pages of Practical Ideas, and installment nine of H. P. Bailey's series on portable tools. In accord with your wishes, these are all short and fact-jammed.

Vapor Plating . . . Electroplaters haven't said much about a tricky new process of coating by evaporation, but it's a real answer to many plating problems. Here the former owner of a plating plant puts down in black and white all about the process and how to use it successfully. Hard data for us to come by, but worth the effort.

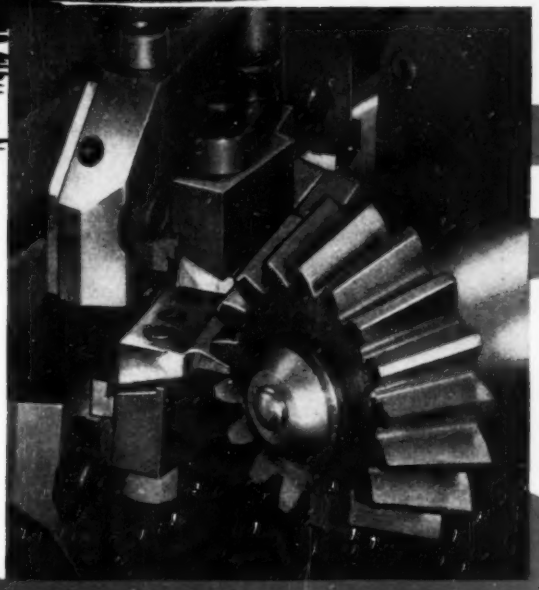
Coming . . . *A.M.* for Sept. 22 will be a compendium of short articles—some 11 of them on as many different subjects. We lead out with a cover Kodachrome on shot peening that's unusual. Then there's a report on methods of inspecting jet turbine blades—prime present problems—and from the prime source, the NACA Cleveland laboratories. (This one we had to get declassified for you) . . . The Special Report explains How To Organize A Safety Program, is based on a series of visits all over the East by Associate Editor Andy Ashburn . . . There are articles on cutting racks and pinions, metal spinning speeds, figuring elliptic involutes and evalutes, preventing fires in screw machines, designing progressive dies, jig milling, the need for toolmakers, and a survey of company practice regarding smoking on the job. Our usual departments will be included, of course.

ASSISTANT . . . William M. Stocker, Jr., was born in Baltimore, but grew up in New York City. After graduation from Brooklyn Technical High School in 1940, he went to work in the experimental shop at Wright Aeronautical. A year as a "learner", another in heat-treating, and almost as long as an expediter—then he enlisted in the U. S. Army Air Force. After he finished Mechanics School, he was made a staff sergeant (tech. inspector) and was in Europe two years with the Ninth Air Force. After discharge he was a propeller mechanic for three months, then became asst. to the works manager at Hepworth Machine Co., meantime beginning two years of evening courses in industrial management at Pratt Institute. Later he moved on to Sylvania Electric Products, Inc., as mechanical expediter. He joined *American Machinist* in April, has produced "Sight at Your Fingertips" (July 28) and a short report—is now working on our Cost Cutting Clinic, Oct. 6.

COMPLETELY UNIVERSAL...

for

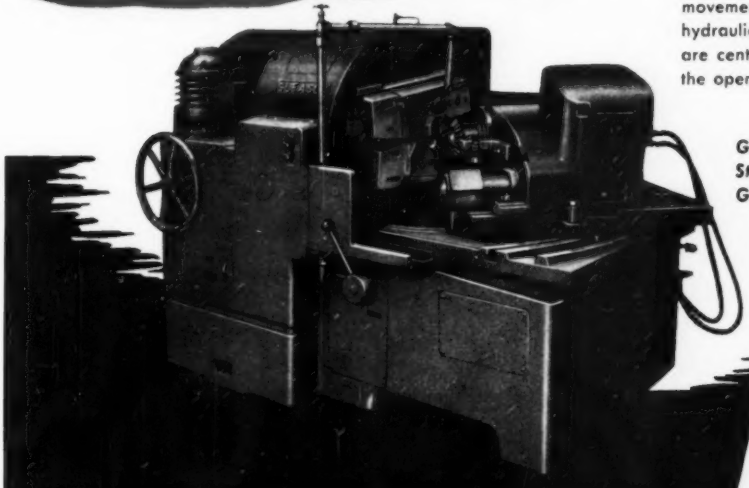
ROUGHING *and* FINISHING



The No. 14 Straight Bevel Generator employs the generating method in which the tooth profile shape is produced by rolling the teeth between the two reciprocating tools.

The Gleason No. 14 Straight Bevel Generator produces Coniflex gears in the intermediate sizes. These straight bevel gears are both roughed and finished on this machine. Many outstanding features of this machine contribute to its versatility, such as:

1. The ability to cut Coniflex gears (i. e., straight bevels with localized tooth bearing).
2. Faster cutting times made possible through greater machine rigidity.
3. Ease of operation—sliding base movement and clamping of work are hydraulically operated. All controls are centralized within easy reach of the operator.



Gleason No. 14 Straight-Bevel Generator

GLEASON *Works*
1000 University Avenue
Rochester 3, N. Y., U. S. A.

Builders of Bevel Gear Machinery for Over Eighty Years

AUTOMATIC BACKLASH ELIMINATOR

A B-L E

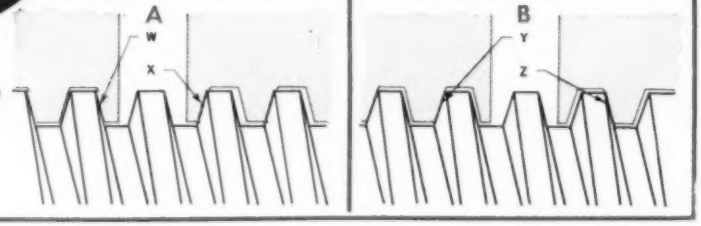
UP-MILLING

DOWN-MILLING

Fill in letters A B-L E, and you have Automatic Backlash Eliminator, a standard feature of CINCINNATI High Power and Dual Power Dial Type Milling Machines. This feature enables you to mill down as well as up; without adjustment or special setting; without giving the table feed screw and nut a second thought. ¶ Down-milling operations may not predominate in your shop, but you'll find that they eliminate a lot of trouble when milling thin slab shaped parts that are difficult to hold, and when breakout at the end of the cut cannot be tolerated. The Cincinnati Automatic Backlash Eliminator takes these worries off your mind. ¶ Other cost reducing features of CINCINNATI High Power and Dual Power Dial Type Milling Machines; up to 50 hp for the Nos. 5 and 6 sizes; automatic table feed cycles; 100 to 1 spindle speed ratio; Dynapoise overarm. You may obtain complete data by writing for literature.

CINCINNATI No. 5 Plain Dual Power Dial Type. Catalog M-1647 contains complete specifications for the Dual Power Dial Types, and M-1664 for the High Power Machine. Copies will be sent on request.

CINCINNATI

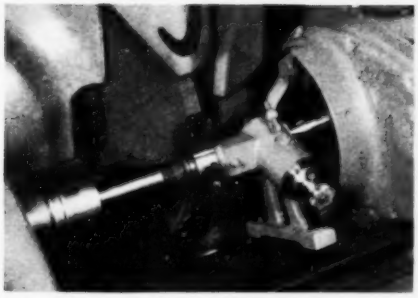


Right: These two sketches show how backlash is automatically eliminated in the table feed screw. Two nuts are employed, which tend to rotate in opposite directions. In A, the internal threads of the nuts are firmly seated against opposite sides of the feed screw threads, points W and X. *No backlash.* In B, direction of rotation of the lead screw has been reversed. *No backlash.*

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

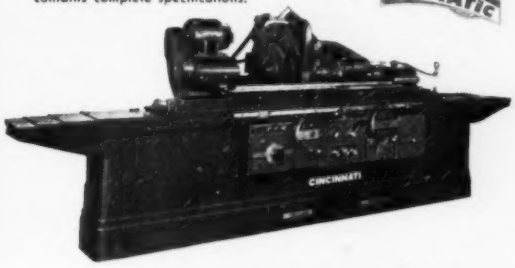
MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



Above: Close-up of table type micrometer truing device, for truing the diameter of both wheels and the face of the one at the right.

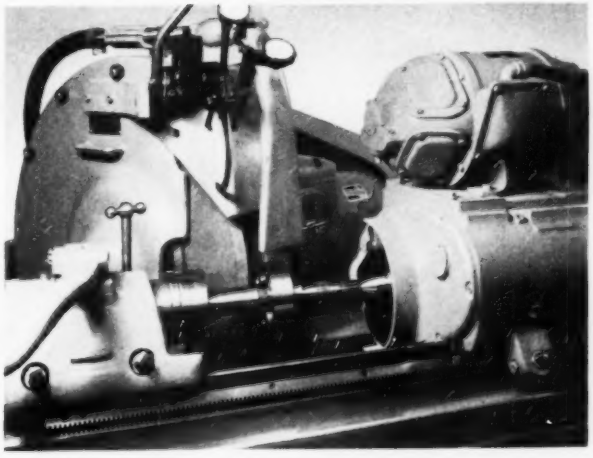
Below: CINCINNATI FILMATIC 10" Plain Hydraulic Grinding Machine. Write for catalog G-572 which contains complete specifications.

FILMATIC



Below: CINCINNATI FILMATIC 10"x 18" Plain Hydraulic Angular Wheelhead Grinder, arranged with two wheels to grind the diameter and face of a part without readjusting the cross feed.

CINCINNATI FILMATIC 10" PLAIN



Grinds diameter and adjacent face without resetting for size

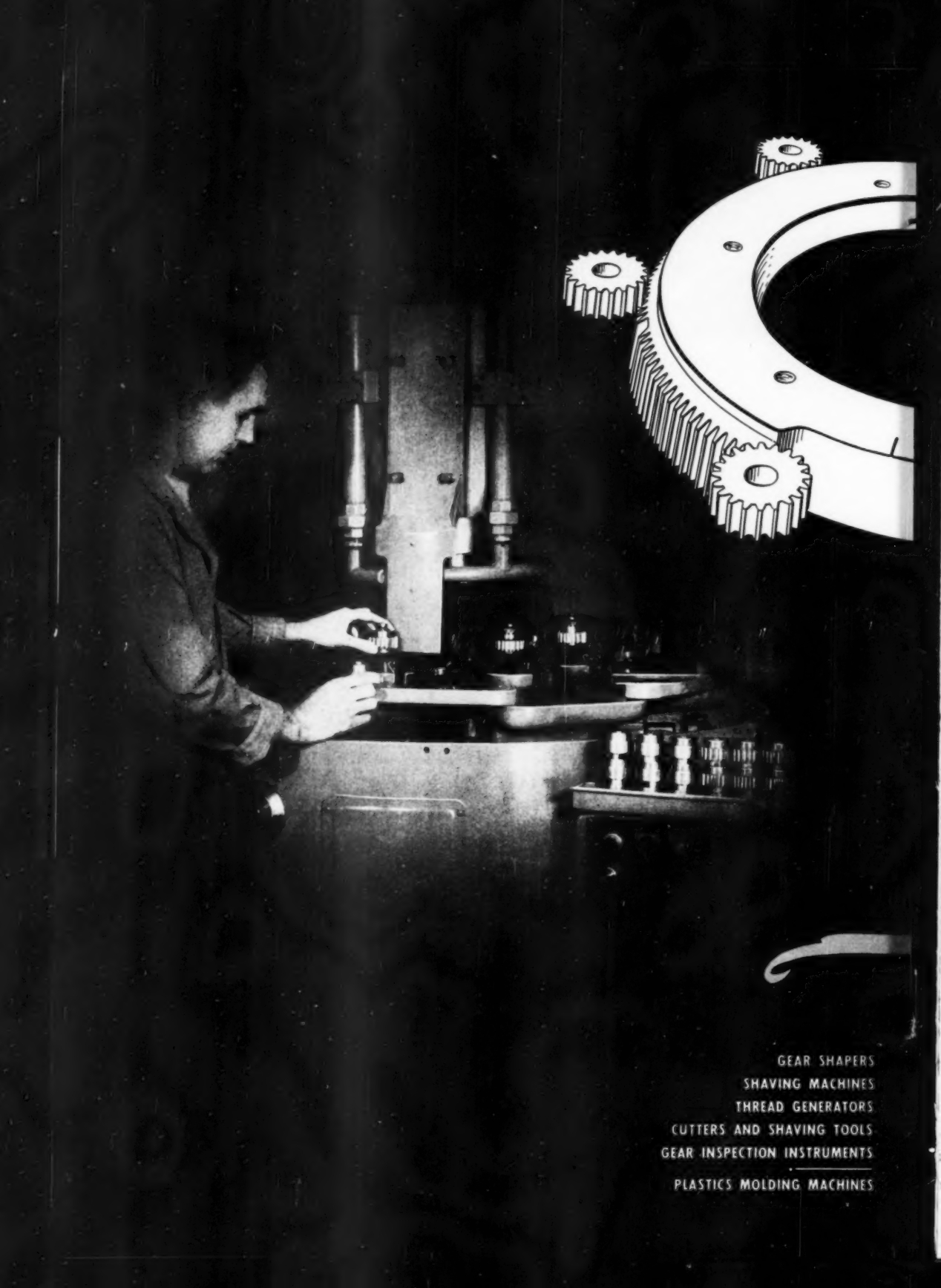
When the blueprint calls for a precision ground surface on the face of a flange, you need the advantages offered by an angular wheelhead grinder. The equipment shown here handles an operation of this type, and in addition, it also grinds the largest diameter to accurate size. To take care of both surfaces at the lowest cost, Cincinnati Application Engineers devised a two wheel setup on a 10"x 18" FILMATIC Plain Hydraulic Angular Wheelhead Grinder. The large diameter is infeed ground to accurate size, and then without readjusting the cross feed, the table is moved to the left to bring the face of the work against the second wheel. This arrangement is simple, accurate and productive. ¶Other features of this setup include transposed headstock and footstock, table type micrometer wheel truing device, swinging indicator gages for visual inspection while grinding, and two-inch wheelhead retraction with hand hydraulic control. CINCINNATI FILMATIC Angular Wheelhead Grinders are available in 6", 10"-L, 10" and 14"-L sizes. Our engineers will be glad to tell you more about these machines.

CINCINNATI

CINCINNATI GRINDERS INCORPORATED

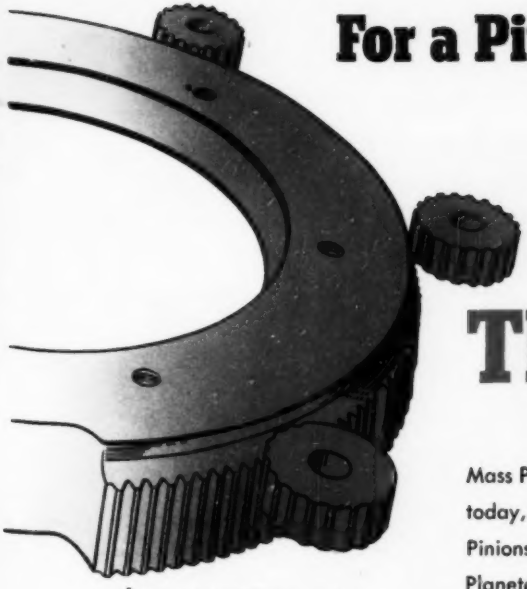
CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES



For a Pitch Dia. to 3.375 in.*

Costs and Speed Commend

The Planetary

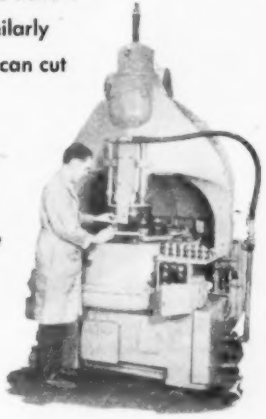
1 One big 17" cutter reciprocates continuously...

2 Work on 6 spindles are roughed and finish-cut, while revolving continuously around the cutter...

3 A gap provides for loading and unloading without stopping the machine

4 Fast roughing, fine finishing; easy cutter sharpening, are outstanding advantages

Mass Production gear cutting *where quality counts* is a job today, for a heavy-duty, Planetary principle Gear Shaper. Pinions and small diameter gears belong on the Fellows Planetary—with 6 busy work-spindles planeting around while the big non-rotating cutter reciprocates at high speed. The machine is built heavy and rigid, for maximum stock removal without loss of accuracy...on the 10 pitch, 20 tooth, cold-rolled-steel pinions pictured, cutter speed is 400 strokes per min., for 3/16" face width teeth—with a floor-to-floor output of *120 pieces per hour*. If you have a high-production requirement on similarly small gears, perhaps the Planetary can cut your costs way down, too. For consultation, or literature, call on the nearest Fellows office.



*Maximum pitch diameter of work is governed by several factors, such as: pitch, material and helix angle. For more complete information, submit your problems to our Engineering Department.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont.
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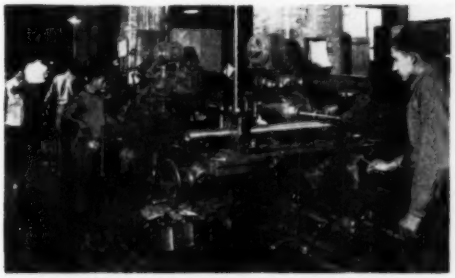
No. 36...

Ram Type Milling Machine. Adjustable cutterhead permits horizontal, angular or vertical milling on one machine.

"It pays to Van Normanize"

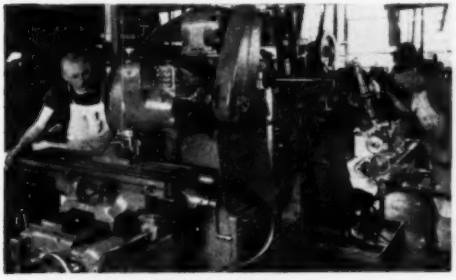
NORMAN MILLERS

Speed Production in All Types of Plants



JOB SHOP — Van Norman Ram Type Millers perform all types of milling from horizontal to vertical by simply positioning the adjustable cutterhead.

PRODUCTION — Long runs or short runs, Van Norman Millers maintain production and quality on all types of work.



PATTERN AND DIE SHOP — The adjustable cutterhead on ram type millers permits a wide variety of work to be performed as encountered in this type of work.

TOOLROOM — Van Norman Horizontal and Ram Type Millers meet the requirements of accurate milling required in toolroom operations.

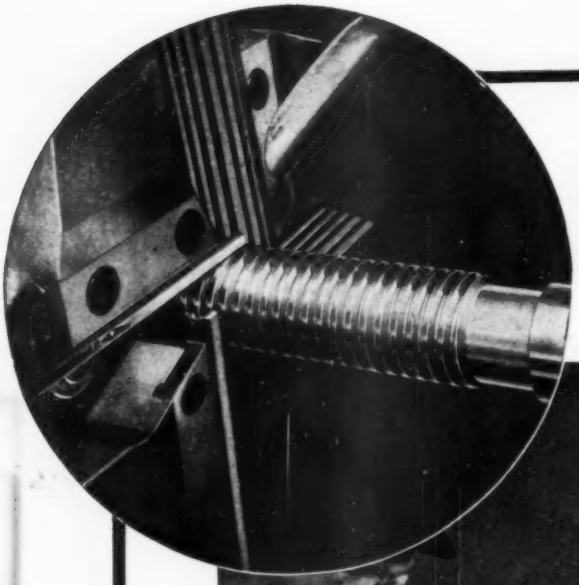
Here's How You Can Cut Costs and Increase Production

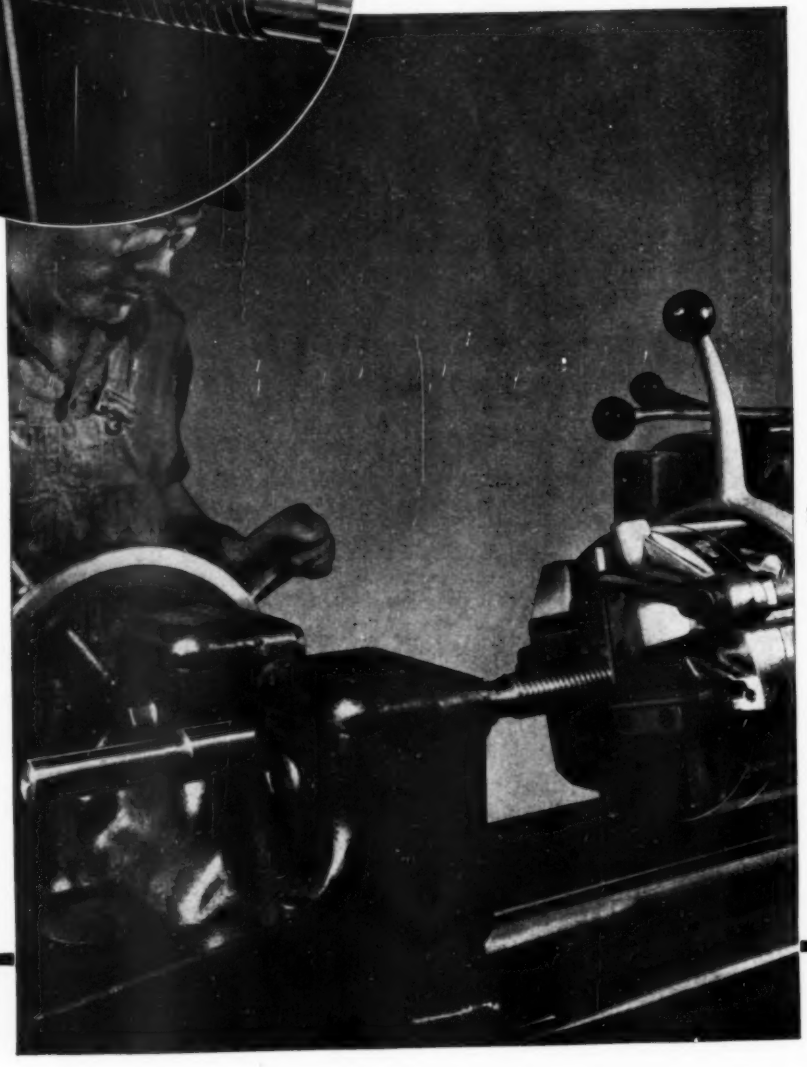
Regardless of the type of plant or type of work, Van Norman Millers . . . ram type and horizontal knee type . . . can cut your milling costs and speed production. These millers enable operators to perform more work because they are easy to operate. All operating controls are located at the front and rear of the machine saving operator steps, giving full cutting view to the operator. The extra heavy column, base and knee assemblies assure maximum rigidity . . . increase the accuracy of the machine. Large easy-to-read dials facilitate work adjustments. Quick change speed and feed selectors permit easy selection of the right feed and speed for every cut. Write for catalog describing the complete line of Van Norman Millers.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

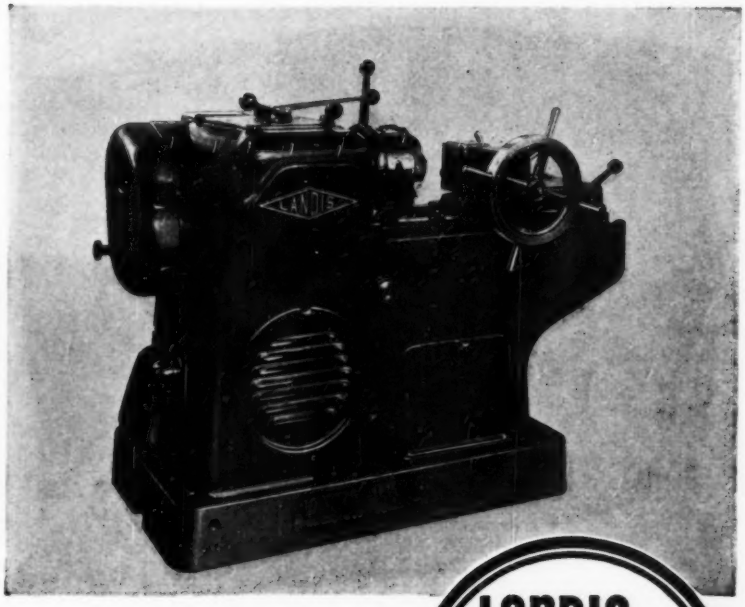
SAVING IN





THREADING TIME-94.2%

Landmaco Threading Machine Cuts Right- and Left-Hand Threads in 4.66 Minutes.



• 79.74 minutes formerly were required to cut threads on both ends of vise screws. The 1⅝" 4 pitch Acme threads 5¼" long on each end are now cut in one pass in 4.66 minutes, floor-to-floor time, using a Landmaco Threading Machine equipped with Leadscrew Attachment.

In finishing 12.9 pieces per hour, the machine is operated at a cutting speed of 24 surface feet per minute at 57 R.P.M. This large eastern manufacturer states that "production is increased 1710% over best methods previously used."

Write for Bulletin H-75

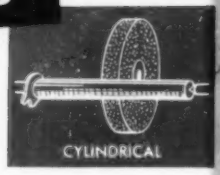
LANDIS Machine COMPANY
WAYNESBORO PA., U.S.A.

WORLD'S LARGEST MANUFACTURER OF ALL TYPES OF THREADING EQUIPMENT

Your Best Buy in Small Grinders

2 machines in One

12" x 28" UNIVERSAL and TOOL GRINDER

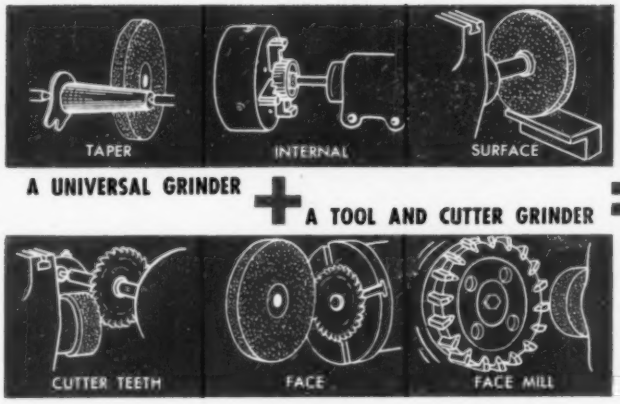


Write for Catalog K45 for full information on the 24 different grinding operations that can be performed on this versatile machine both as a universal grinder and as a tool and cutter grinder. It includes specifications and features of this machine together with setup pictures of typical grinding operations.

LANDIS TOOL *Precision Grinders*

SPECIALLY DESIGNED FOR WET OR DRY GRINDING

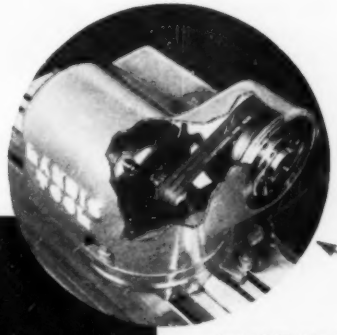
The coolant tank and drain troughs are integral parts of the bed casting. All operating mechanisms are thoroughly protected to eliminate abrasive material resulting from dry grinding operations.



LANDIS TOOL
12" x 28" UNIVERSAL and TOOL GRINDER

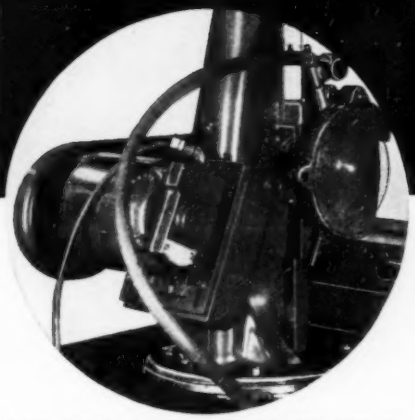
LOW CAPITAL INVESTMENT...You really get two machines in one with the 12" x 28" Universal & Tool —an ideal one machine grinding department for the tool room or small shop at a big saving in capital investment over separate machines.

WITH PLUS FEATURES



COMPACT ALL VEE-BELT HEADSTOCK

Low compact headstock particularly good for face grinding operations. All Vee-belt drive assures smooth power and fine finishes. Only two revolving parts; the electric motor and face plate or spindle.

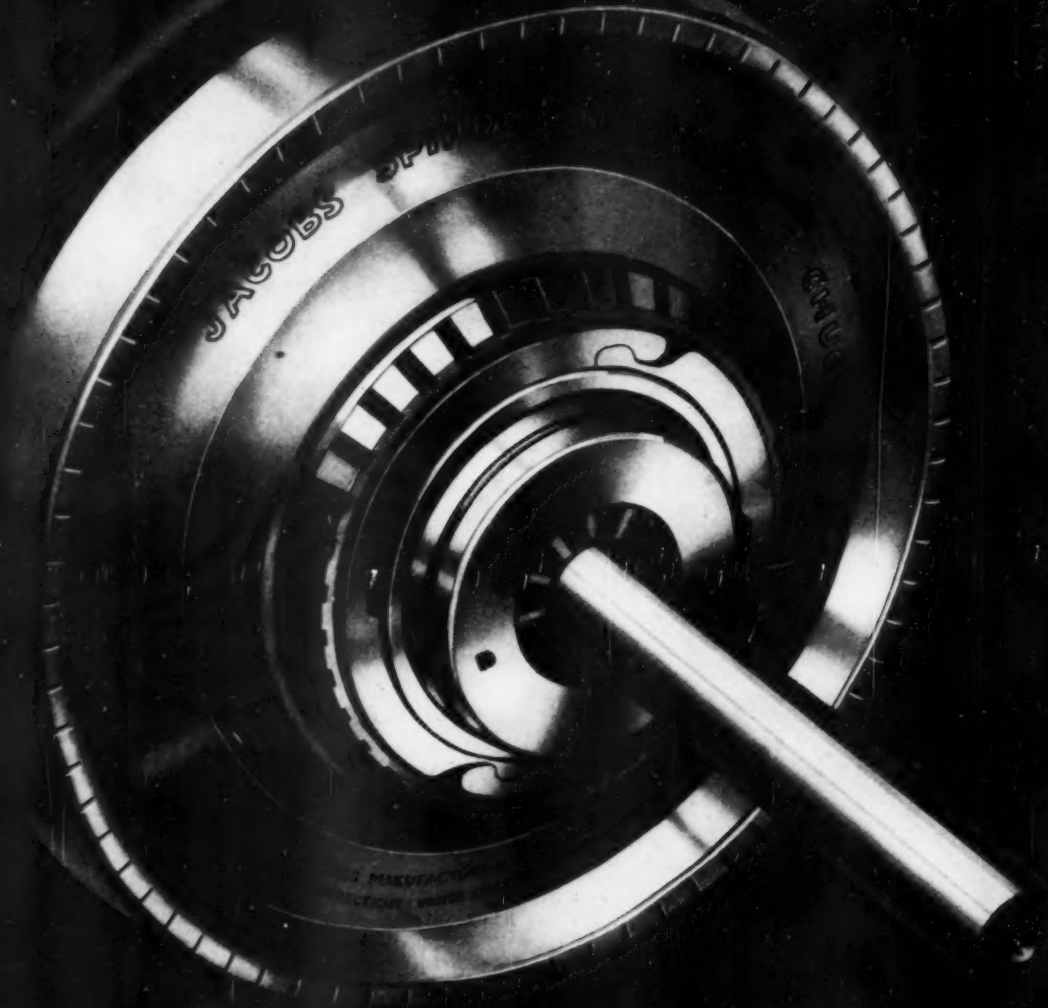


RIGID MOTOR MOUNTING ON MASSIVE COLUMN

The motor is adjustable for changing belt tension. Column made with heavy sections, well ribbed. Vertical ways protected under wheel head by telescoping guides.

LANDIS TOOL COMPANY
WAYNESBORO, PENNA.

Now.



The new Jacobs Spindle Nose Lathe Collet Chuck. Introduced at the Chicago Machine Tool Show, now further refined and extensively field tested and proudly presented to you through Jacobs Distributors.

FOREMOST IN CHUCKS · FIRMEST IN GRIP ·

The *Jacobs* SPINDLE NOSE LATHE CHUCK

THE JACOBS MANUFACTURING COMPANY
West Hartford 10, Connecticut

If it's a JACOBS . . . it holds!

Jacobs brings you the most amazing Lathe Collet Chuck in machine tool history!

NO OTHER LATHE COLLET CHUCK CAN GIVE YOU ALL THESE ADVANTAGES:

SUPER ACCURACY . . . Precision built to deliver accuracy never before obtainable in collet equipment. *The most accurate collet chuck in the world today.*

TREMENDOUS GRIP . . . Gives two to four times the gripping power of split steel collets. *You can now use the maximum speeds and feeds of the most modern tool room lathes — safely.*

AMAZING COLLET RANGE . . . Each collet has a full $\frac{1}{8}$" gripping range. *Eleven Jacobs Rubber-Flex Collets will chuck any bar between $\frac{1}{16}$" and $1\frac{3}{8}$"* . . . one collet does the work of eight.

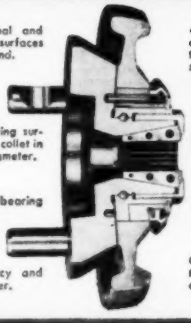
EXTRA DURABILITY . . . The handwheel is solid aluminum and the forged alloy steel body is hardened and ground. All other parts of the chuck are of alloy steel, *hardened and ground throughout.*

NO FATIGUE . . . A unique impact mechanism allows rigid tightening and easy opening of the chuck *with a flick of the wrist.*

UNEQUALLED ECONOMY . . . You buy a chuck that will perform a COMPLETE job of chucking — *you save both on original investment and maintenance.*

DEVELOPED BY JACOBS . . . This new Spindle Nose Lathe Chuck is a product of Jacobs' development engineers. *The Jacobs Manufacturing Company is the world's foremost producer of drill and tap chucks.*

SEE YOUR JACOBS DISTRIBUTOR — A special eight-page illustrated bulletin is available from your Jacobs Distributor.



1. All external and internal jaw surfaces precision ground.

2. Long bearing surfaces on each collet in relation to diameter.

3. Collet jaw bearing surfaces always parallel to and in full contact with work, assuring accuracy and gripping power.

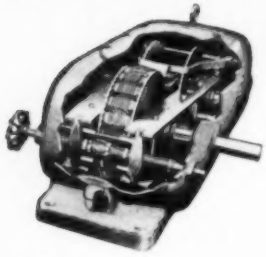
4. Rubber area of collet closes down on the work, completely sealing collet and chuck against entry of chips, dust, coolants, etc.

5. The compact design permits chucking close to the spindle nose. It allows a saving of 1" to $1\frac{1}{2}$" of overhang compared to the steel collet chucks now on the market.

Cutaway view of the chuck with collet in place.

In closing down the collet throughout the entire $\frac{1}{16}$" range, perfect parallelism is maintained between the extra long collet bearing surfaces and the work—accuracy and gripping pressure are constant. Unlike steel collets, no concession is necessary for spring temper and the alloy steel collet jaws are held to maximum hardness for long wear under rugged conditions. The rubber is permanently bonded and mechanically locked to the jaws, and is not affected by heat, coolants, or cutting compounds.

GREATER FLEXIBILITY... HIGHER PRODUCTION

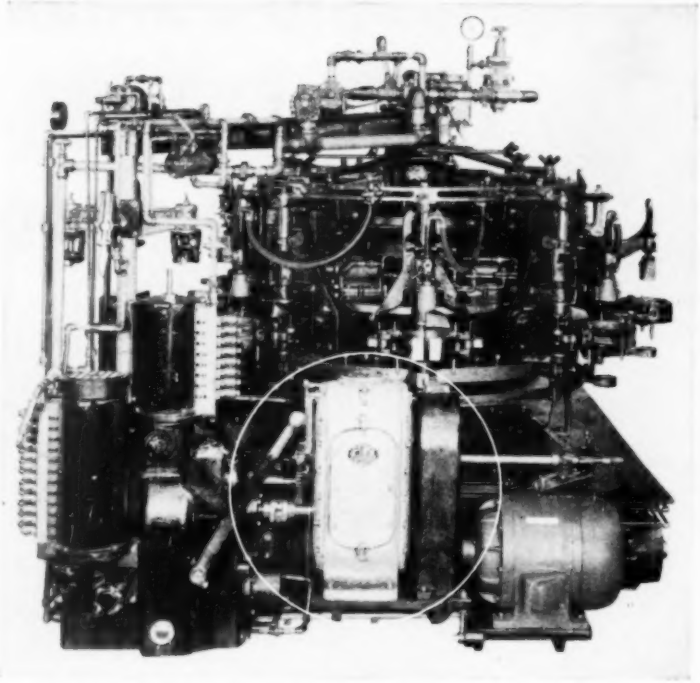


with

LINK-BELT P.I.V. Variable Speed Drive

Advantages of the Link-Belt P.I.V. Variable Speed Drive over fixed-ratio gears are clearly seen in such applications as the glass container machines built by the Lynch Corporation. With P.I.V. Variable Speed Drive, the speed of the machine can be altered instantly, while running, so no time is lost.

A second advantage of the P.I.V. Drive is that it provides for infinite variation between input and output speeds, instead of a limited number of ratios or steps. In starting a run, or when changing molds, the value of these features is at once apparent.



Lynch Corporation's model 16-B machine, end view, showing Link-Belt P.I.V. Variable Speed Drive.

Modern Glass Container Machines Equipped with Positive, Infinitely Variable Speed Drives

The P.I.V. Variable Speed Drive is unique, in that it utilizes the positive engagement of chain and toothed and grooved wheels, eliminating all possibility of slip or creep. All metal, wholly enclosed, splash lubricated, the P.I.V. Drive is highly efficient, durable and trouble-free in operation, requiring practically no attention. It is easily adapted to existing drives, and can be had in vertical or horizontal types, motorized or plain and with or without extra reduction gears. Sizes up to 25 H.P. Book No. 1874-B gives complete description and application data. Send for copy, now!

LINK-BELT

Power Transmission Machinery
"THE COMPLETE LINE"

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Houston 3, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

11,585

"For years I've bought machines of this type... but this is the first one I ever could

COUNT ON!"

Give your customers (and customers-you-hope) the thrill of discovery . . . of discovering something *new* in your product . . . something that gives them *new* advantages in use . . . *new* pride of ownership . . . *renewed* respect for you as a modern merchandiser!

How? Build a Veeder-Root Counter into your product. *But what kind of counter, and how to build it in?* Those are questions that a Veeder-Root engineer will answer promptly and squarely . . . if you let him concentrate his "mathematical eye" on your product.

And why let him do that? Because there are so many types of Veeder-Root Mechanical and Electrical Counters . . . and because so many of the most successful applications were not apparent at first, *at all.* Now, couldn't you *profit more* by having your product keep its own production records, prove its own service guarantee, protect customers against shortages and surpluses . . . or provide any of the many other new advantages that come with built-in Veeder-Root *Count*rol? It costs exactly 3 cents to find out. *Write.*

No. 1122 V-R Small Reset Ratchet Counter is built into a wide range of products from addressing machines and aerial cameras to hay balers, laundry machines, linotypes, shoe machinery, machine tools and — what have *you?* For a quick picture of the range of V-R Counters, send for free 8-page Condensed Catalog (shown). *Write now.*

Veeder-Root **COUNTERS**

VEEDER-ROOT INC., HARTFORD 2, CONNECTICUT

In Canada: Veeder-Root of Canada, Ltd., 955 St. James Street, Montreal 3. *In Great Britain:* Veeder-Root Ltd., Kilspindie Road, Dundee, Scotland.

no more hand-me-downs

for stainless sheet and strip

Stainless sheet and strip production is coming of age—no longer made on the hand-me-downs of carbon steel production, thanks to modern advances in strip mill practice. CRUCIBLE, drawing on this progress and on generations of *specialty* experience, has carried stainless development even further by building the world's first complete mill designed *specifically* for hot and cold rolling of stainless steels. In this $18,000,000 project, every building, every piece of equipment, has been built to incorporate the *best* of accepted modern practice, PLUS exclusive features designed by CRUCIBLE's industry-famous technical staff.

Here stainless sheet and strip is produced in widths from ½" to 50" inclusive, in all gauges, grades and finishes. This new and important contribution to the production of stainless steel is vital news to every processor of stainless steel products. For now CRUCIBLE, one of the pioneers in stainless steels, rounds out an integrated program of stainless in all its forms—sheets, strip, plates, bars, wire, forgings, castings and tubing (manufactured by the new subsidiary, Trent Tube Co.). To this program CRUCIBLE has applied its *specialty product* methods of quality control, methods that have given CRUCIBLE leadership in special purpose steels for half a century. Data sheets for all grades are yours for the asking. Your inquiries will be welcomed.

new tools for a **MASTER** mechanic

CRUCIBLE STEEL COMPANY OF AMERICA
405 Lexington Ave,. New York 17, N. Y.
Branches, Warehouses and Distributors in Principal Cities

CRUCIBLE first name in special purpose steels

hot and cold rolled **STAINLESS SHEET AND STRIP**

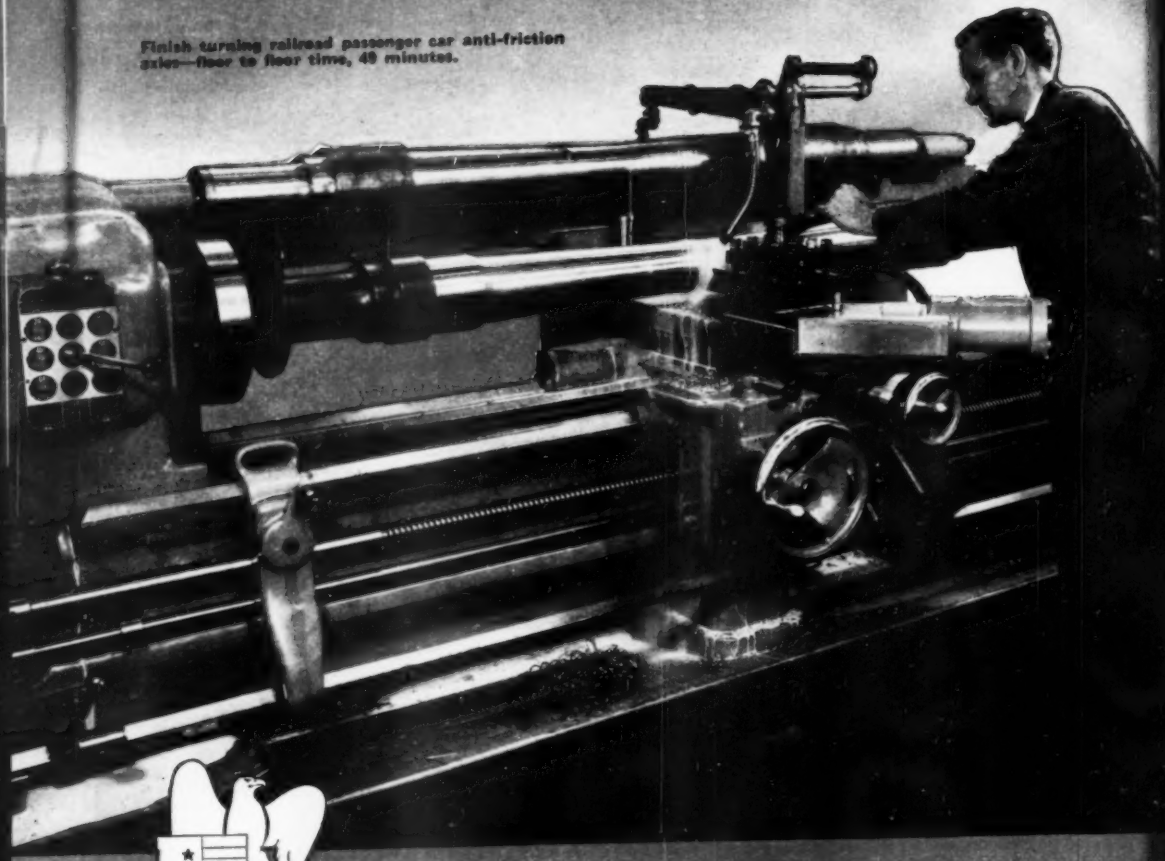
STAINLESS • HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE • STEELS

Production Costs hit a new low—

The "American" Hydraulic Shaft Duplicator introduces a new technique in shaft turning that has revolutionized the art. It is a thoroughly engineered development for reproducing work shapes from a template by means of a hydraulically controlled cutting tool. The template holder and tracer head are built-in at the rear of the lathe where they will not obstruct the operator's vision of the work or interfere with loading and unloading. All operating controls are located at the front of the lathe.

It is faithful and accurate in its reproduction.

Finish turning railroad passenger car anti-friction axles—floor to floor time, 49 minutes.



THE AMERICAN TOOL WORKS CO.

Rough and finish turning motor shafts 42½" long from 3¹⁵⁄₁₆" bar stock in floor to floor time of 39 minutes.

...THE LATEST *Cost Cutting* SENSATION!

Reductions of 75% are not uncommon.
Reductions of 50% are average.

It will reproduce steps, tapers, right angle and tapered shoulders, recesses, grinding necks and radii and is especially adapted to the production of such work as spindles, motor shafts, valve stems, back shafts, piston rods, axles . . . in fact any shaft having an irregular contour.

A single hydraulic system is employed for operating the hydraulic tracer valve and the piston which controls the movement of the tool slide carrying the cutting tool. This simplicity is an outstanding feature and insures accurate reproduction, freedom from failures and elimination of work rejects. This new metal cutting technique permits continuous cutting without interruption for measuring or calipering at feeds and speeds to the cutting limit of Cemented Carbide tools. "Miking" is confined to the first diameter only after which all other diameters are secured automatically.

This machine may be quickly converted to standard lathe operations.

Descriptive Bulletin No. 35 sent upon request.

Cincinnati, Ohio U.S.A. LATHES AND RADIAL DRILLS

LESS "pickup" LESS "splatter"

Use G-E slope control for resistance welders

Tip "pickup" in spot-welding aluminum and expulsion in projection welding is reduced with this new Slope Control developed at General Electric. It is a method of applying current in gradually increasing intensity that results in longer operation of electrodes without the frequent cleaning usually required.

Here, again, is evidence of the research continually conducted at General Electric to improve welding methods—to make the production of improved products easier and less expensive. Here are the answers to the questions we knew you'd ask about Slope Control.

Q. What is Slope Control?

A. It is supplementary equipment used with a standard synchronous or non-synchronous precision control panel that regulates the rate at which current rises to welding value, and is adjustable in terms of cycles to reach final current.

Q. What effect does this have on the finished weld, and is it slower?

A. Our tests have shown that there is less tendency for porosity, which means stronger welds, and that it does not appreciably slow the work. See the cross sections of welds made with Slope Control.

Q. Can I use it on my present G-E electronically controlled welder?

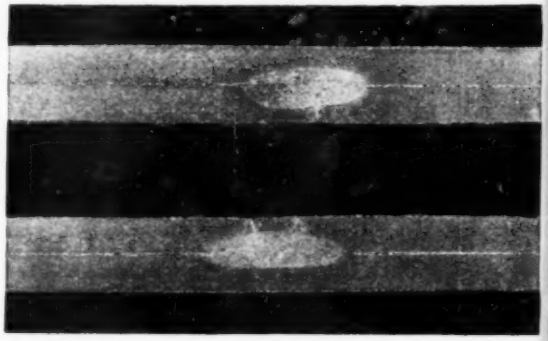
A. Yes. It is a separate panel that can be easily added to most modern G-E controls.

Q. With what types of welders and metals can it be used?

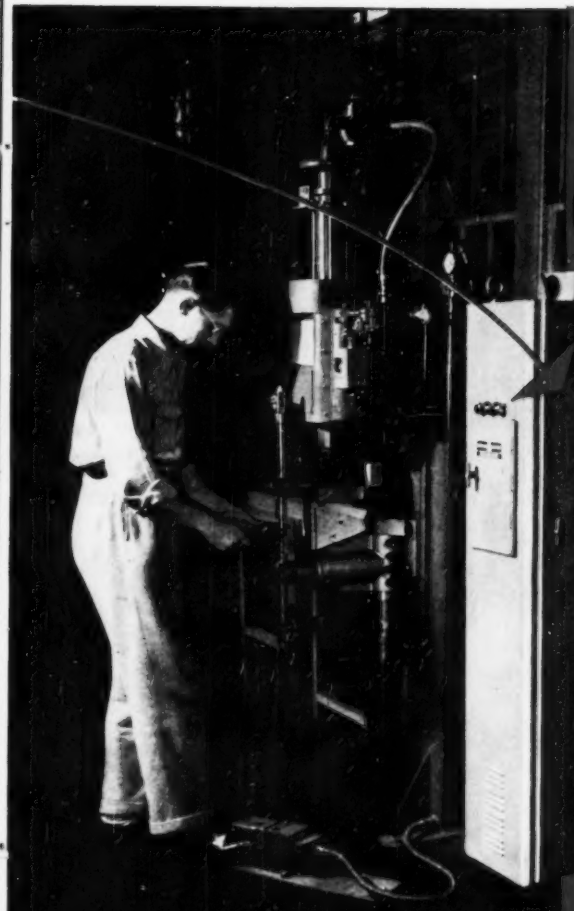
A. Use it for spot-welding aluminum (see the illustration), for projection welding aluminum or steel (it reduces expulsion), and for multiple projection welding, where you'll find improved results on non-uniform projections. It may be used with almost any metal, but aluminum and its alloys present a tough problem it can solve.

More details on G-E slope control in Bulletin GEC-534. Fill in and send in the coupon now. And when you have control problems for resistance welders, consult the nearest G-E sales engineer. He'll give you an unbiased answer based upon years of G-E experience with all types of welding. Whether it's a power factor problem, or the selection of the most suitable control for a specific job, you can be sure of your facts when they come from General Electric. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

Cross sections of aluminum spot welds produced with slope control (a microphotograph).

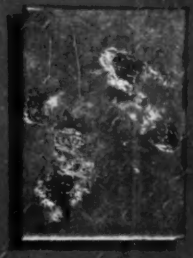


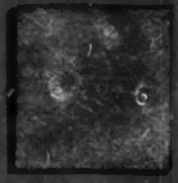
GENERAL ELECTRIC



Projection welding with synchronous precision control. Slope control is mounted in side door of unit (small door open). Can also be used with standard 60-cycle spot welders having non-synchronous welding control.

Whether you're welding aluminum or heavy gage steel ...THIS IS FOR YOU





Splatter reduced. Compare surfaces of these aluminum plates. Above, welds produced with single-phase, synchronous precision electric controls. That at left, with the addition of slope control.

ASK TO SEE "This is Resistance Welding," General Electric's More Power to America, four-color, sound motion picture covering every phase of this manufacturing process. Contains tips for improved production for operators of machines, design engineers, and supervisors. Contact your Resistance Welder manufacturer, Power Supplier, or the nearest G-E office.

Tip pick-up reduced. Electrode on left has been used 117 times with slope control. That at right used 41 times without slope control. Note wide area of aluminum pick-up.

General Electric Co., Sec. B645-50
Schenectady 5, N. Y.

Please send me Bulletin GEC-534 on Slope Control.

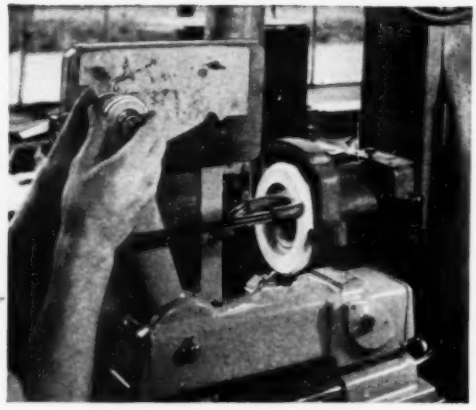
.....I would like a showing of "This is Resistance Welding."

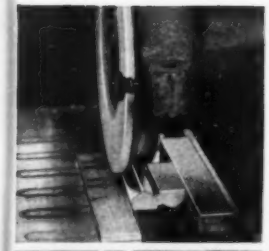
NAME.....

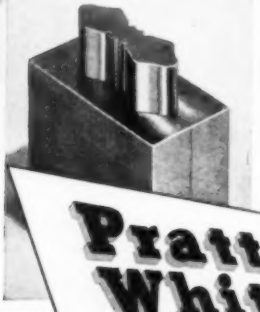
ADDRESS .....

.....

FORM-GRINDING TO NEW STANDARDS OF ACCURACY







BY PRECISION-DRESSING WITH THE NEW

Diaform

WHEEL FORMING ATTACHMENT

PRATT & WHITNEY has it . . . the new precision DIAFORM: a portable attachment that can be used on any horizontal spindle surface grinder to form-dress grinding wheels *to tenths of a thousandth accuracy in a matter of minutes.*

Operating on the pantograph principle, DIAFORM accurately traces any form from an inexpensive template at a reduction ratio of 10:1. The dressing diamond is traversed over any grinding wheel up to 1" wide x 10" diameter by very light tracer pressure to form-dress the desired contour.

DIAFORM is built to exacting Pratt & Whitney standards of precision — to produce better dies . . . better punches . . . better flat forming tools *in hours instead of days.*

Pratt & Whitney

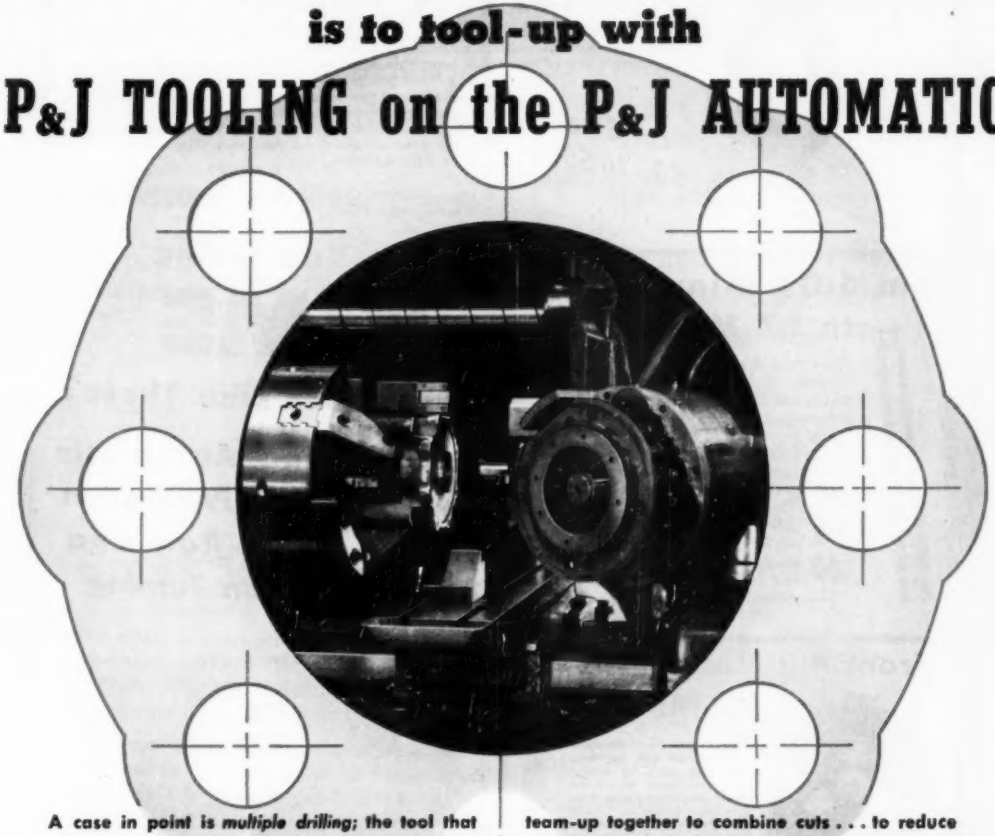
Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

This new Bulletin tells the whole DIAFORM story, illustrating the time-saving procedure to produce an accurate split die and punch, from drawing to finish-grinding. Drop us a card for your copy.

Diaform for low cost, precision form-dressing of grinding wheels

Sure Way to Avoid Secondary Operations is to tool-up with

P&J TOOLING on the P&J AUTOMATIC



A case in point is *multiple drilling;* the tool that does the trick is the P&J self-driven Multiple Spindle Drill Head. It drills, countersinks or reams any number of holes to precision specifications for size, location and alignment — all in the one holding, as the conventional part of a sequence of high speed, fully automatic chucking and turning. That's P&J Tooling on the P&J Automatic! They team-up together to combine cuts . . . to reduce machining time . . . to eliminate extra work handling . . . to save time and money. Production Tooling Headquarters will engineer your tooling for better work, and more of it at the lowest cost per unit. Get a P&J cost and time estimate, and compare. Simply send sample parts or prints; there's no obligation.

Performance Features of the P&J SELF-DRIVEN MULTIPLE SPINDLE DRILL HEAD

As the turret of the P&J Automatic indexes into exact alignment, the P&J Multiple Spindle Drill Head engages with the work chuck which rotates the Drill Head. The drive is transmitted through gears and pinions to the drills, establishing correct speed ratios to finish the job to perfection in the fastest possible time. Action, including feed, is fully automatic.

Potter & Johnston Company
Pawtucket, R. I.
subsidiary of Pratt & Whitney
Division Niles-Bement-Pond Company

P&J

P&J AUTOMATICS...
tooled for Production - Speed - Economy
at Production Tooling Headquarters

From 1.52 to .41 Minutes

This release bearing is a bronze casting which is bored, grooved, chamfered and faced on one side on a Sundstrand Automatic Lathe. It is one of 12 different sizes of parts run over this machine in lot sizes ranging from 500 to 5000 pieces. With the previous method for this operation, the time was 1.52 minutes. After changing the operation over to the Sundstrand, the time was reduced to .42 minutes. Comparable savings were obtained on the other sizes of parts run on this machine.

Lot Sizes 500 to 5000

From 5.02 Minutes to 1.7 Minutes

This steel drive shaft part was formerly turned on conventional equipment in 5.02 minutes. Processing in two operations on a Sundstrand Automatic Lathe reduced the time to 1.7 minutes (including prorated set-up time). This is just one of over 20 different sizes and types of shaft parts run on this machine in lot sizes ranging from 100 to 1500 pieces.

Lot Size 500

From 4.2 Minutes to 1.2 Minutes

The pressure plates are made of both steel and cast iron. They are made in several sizes and types, which are run in lot sizes ranging from 1000 to 3000 pieces. On the part illustrated, changing the operation to a Sundstrand Automatic Lathe increased production from 13 to 46 pieces per hour and reduced the time per piece from 4.2 to 1.2 minutes.

Lot Size 1000

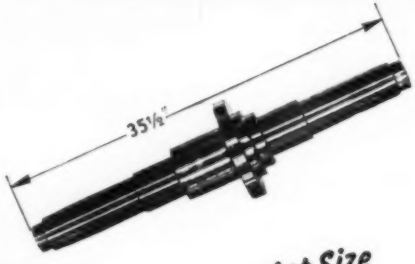
Are You Losing TIME

Turning Jobs Like These?

...Sundstrand Automatic Lathes Increase Production on both Short-Run and Mass Production Turning

These examples of time savings available from Sundstrand Automatic Lathes have been taken from the actual experience of only a few of the many of the users of this modern equipment.

All of the advantages of multiple-tool turning are available on *both* short-run and mass production work. Study these brief sketches and compare the production figures with parts similar to yours... then get the whole story for equivalent or better savings on turning work in your own plant.



Lot Size 950

From 23.7 Minutes to 3.82 Minutes

This track sprocket shaft is a 1045 steel forging with a hardness of 212 Brinell. It is completely turned in two set-ups on a Sundstrand 75 HP Model 16 Automatic Lathe, which has ample power to make full use of multiple tooling and carbide tipped tools. HP consumed at peak load is 84 — maximum depth of cut is ⅞". The reduced machining time, handling time and tool maintenance all added up to a production increase from 1.6 to 8 shafts per hour compared to former method.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

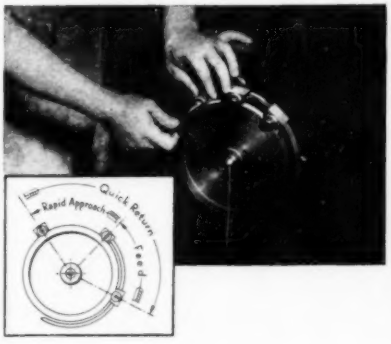
RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

These Exclusive Features Make It Possible to Obtain This Higher Production

Seven machine design features govern the possibility of turning short-run work on Automatic Lathes otherwise limited to mass production turning only. They include (1) Wide range of carriage cycles, (2) Adequate feeds and speeds, (3) Quick cycle change, (4) Simplicity of adjustment, (5) Adequate power, (6) Automatic cycling and (7) High rapid traverse rate. Sundstrand Automatic Lathes have all seven. One of the most important of these is:

Quick Cycle Change for Faster Set-ups

Quicker set-up and easy change-over are possible because of the Sundstrand simple cycle control. This control eliminates making cams for every job to be turned. It provides complete control of all cycles by simple adjustment of dogs on a disc.



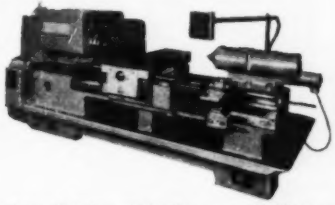
Another important feature is a:

Wide Range of Tool Action...

A wide range of action for front carriage tools is provided by three units, which can be used separately or in combination to give (1) Angular feed-in and tool relief, (2) Slow-up and dwell, (3) Straight feed-in and tool relief. Many combinations are possible by merely making simple adjustments.

Let Sundstrand Engineers Help You Select the Proper Automatic Lathe to Suit Your Work

Let our engineers assist in the selection of the proper automatic lathe for your job, and make tooling suggestions for faster turning of *both* short and long-run work. This competent staff of engineers is available to study your problems and suggest changes for increased production, lower costs. Send complete, accurate information with each inquiry.



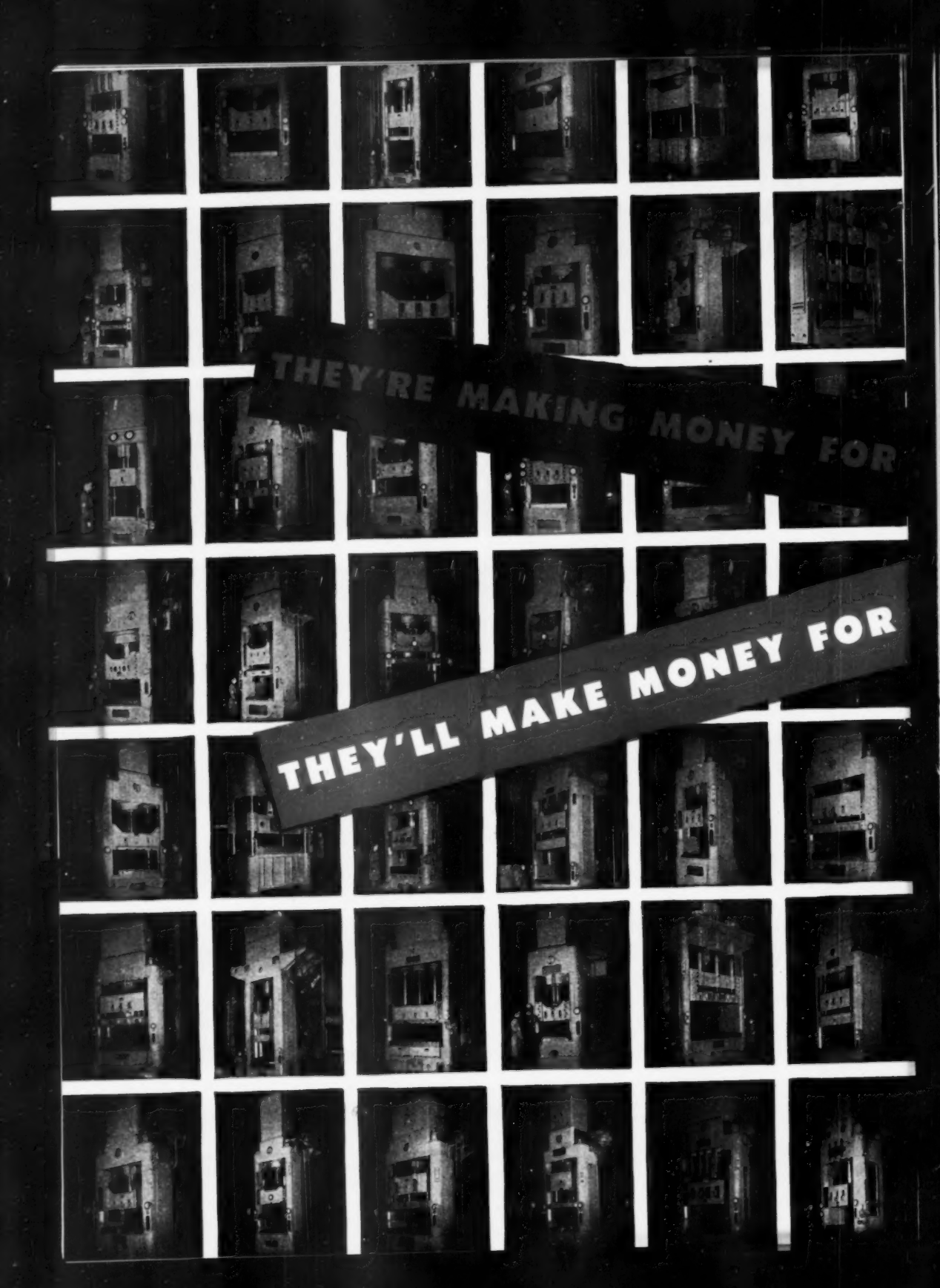
Sundstrand Automatic Lathes are available in work capacities ranging from 5 to 75 HP and in varying speed combinations and lengths. Shown above is a 75 HP Sundstrand Model 16 Automatic Lathe.

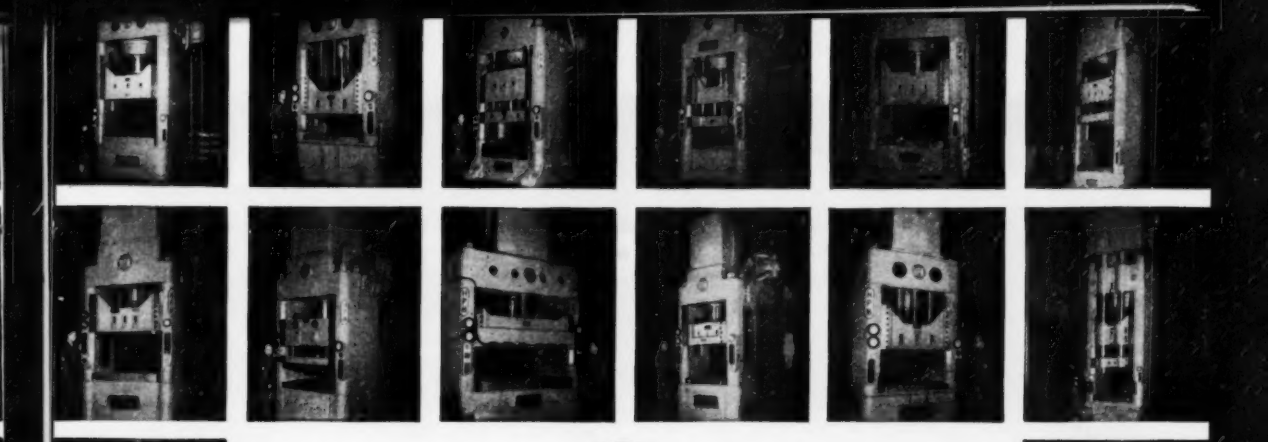
Complete information on Sundstrand Automatic Lathes can be obtained from these booklets. Ask for bulletins No. 187.

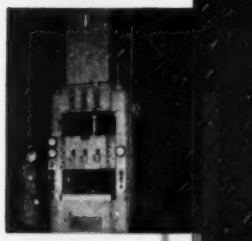
SUNDSTRAND MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES


THEY'RE MAKING MONEY FOR
THEY'LL MAKE MONEY FOR





HPM

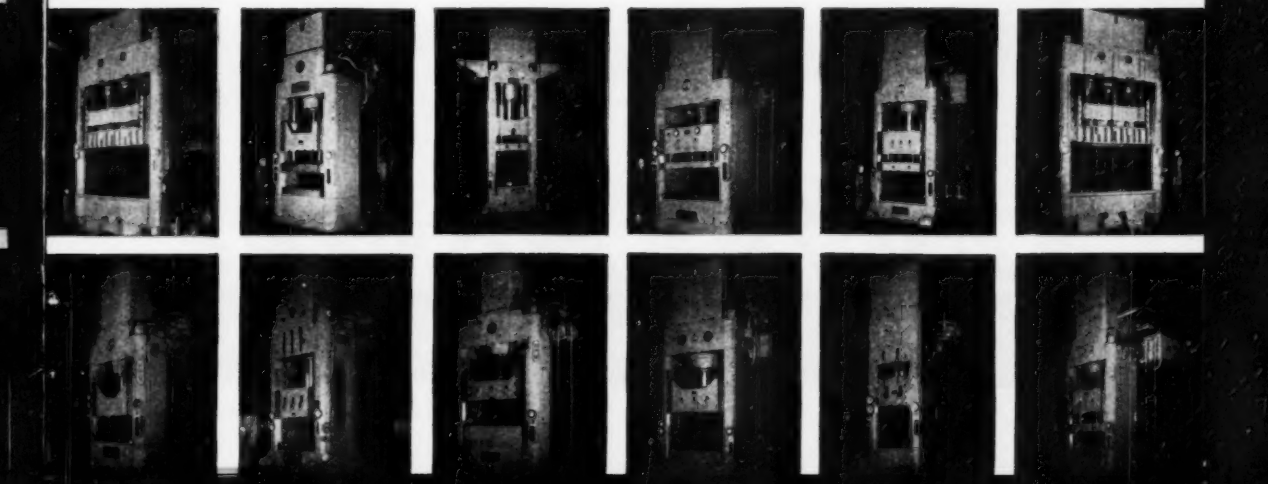
HYDRAULIC PRESSES

Each H-P-M deep drawing press shown here has mastered a production problem in a prominent metal working plant. In each case the results have been . . . increased output . . . fewer rejects . . . a higher quality product at lower cost. Yes, H-P-M hydraulics are the production standard for the metal stamping industry where deep draws are required!

These H-P-Ms were not "dreamed up" over night. They are backed by a press builder with 72 years of hydraulic experience . . . a company which has pioneered such important hydraulic press features as . . . the self-contained press . . . FASTRAVERSE high speed operation . . . closed circuit hydraulic system . . . reversible, variable delivery radial pumps . . . complete automatic press cycle controls . . . variable pressure hydraulic blankholder and die cushion . . . pressure reversal . . . in fact, every known modern development now employed in hydraulic presses.

You capitalize on this "know how" when you specify H-P-Ms. You name the draw job . . . we will choose an H-P-M from among the many hundreds of designs which have already been built and proven. A nearby H-P-M engineer is available to help you. Write today.

THE HYDRAULIC PRESS MANUFACTURING COMPANY
1002 Marion Road • Mount Gilead, Ohio, U.S.A.



···SAVE HOURS AS on Production of

These Sunnen Honing Machines are a vital part of Woodward's versatile production program.

Here's What Woodward Governor Found Out...

MB-1290 Honing Machine. Average installation, less than $800.00 complete with accessories.

"We save countless hours of set-up and production time by using Sunnen Honing Machines."

—I. G. Worden, Supervisor of Grinding Dept.
Woodward Governor Company,
Rockford, Illinois

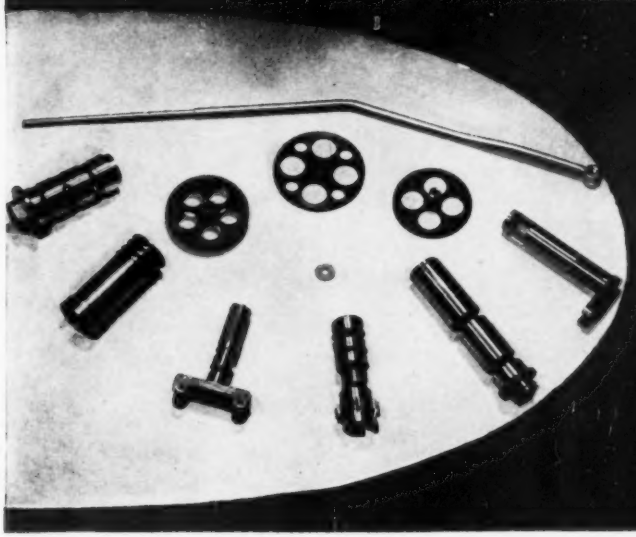
"We also save the cost of jigs and fixtures. And that means something because we make a wide variety of parts. We hold close tolerances and get excellent surface finish."

The Woodward Governor Company, pioneer in its field, has four Sunnen Honing Machines — one in their tool room and three in production. These machines are used for sizing and finishing both open and blind holes.

SUNNEN HONING

Assures Low Cost

WELL AS DOLLARS
Accurate Holes



Yes, Sunnen Honing may be the cost-cutting method you need for producing round, straight holes with life-saving surface finish.

Woodward is one of *many* users of Sunnen Honing Machines who report worthwhile savings — as high as 50% to 60% on some jobs. And they get the surface finish they need for long wear. Stock removal is surprisingly fast; accuracy is guaranteed within .0001" (straightness, roundness, and dimension).

Here's how Sunnen Honing helps cut costs:

- **Saves time, no chucking required**
- **Maintains accurate alignment**
- **Eliminates selective fitting**
- **Speeds assembly of parts**
- **Reduces rejects**
- **Salvages valuable parts**
- **Quickly removes cross-drill burrs and flash**
- **Hones all metals, ceramics and glass**

Investigate Now! You may have several jobs that can be done better by Sunnen Honing. Use the coupon to get free informative bulletins.

SUNNEN PRODUCTS COMPANY
7929 Manchester Ave., St. Louis 17, Missouri
Canadian Factory: Chatham, Ontario

SUNNEN PRODUCTS COMPANY, 7929 Manchester Ave., St. Louis 17, Mo.

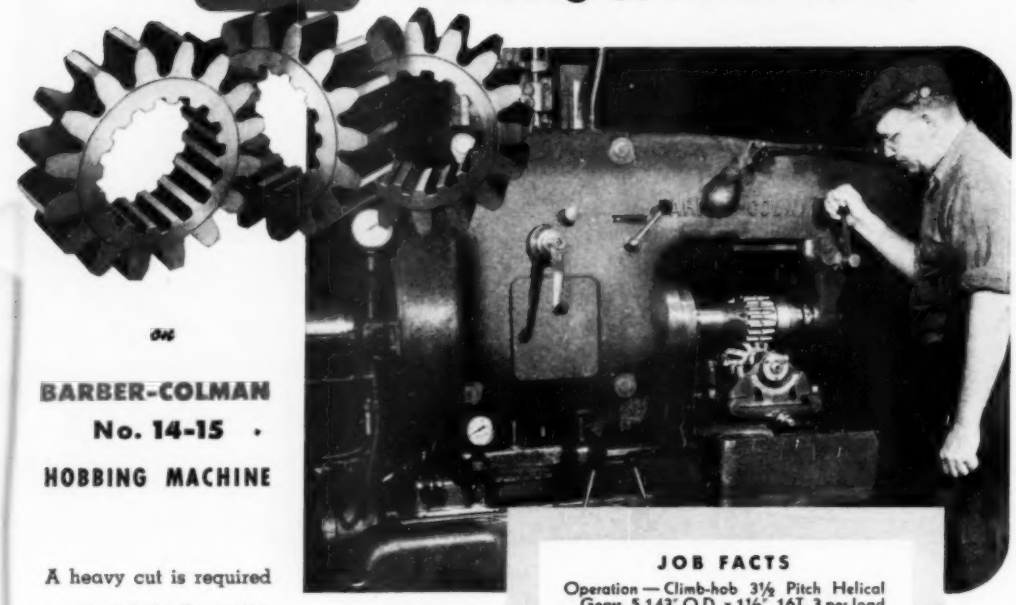
☐ Please send FREE BULLETIN MB-12 (Production Honing)
☐ Please send FREE BULLETIN MB-10 (Tool Room Honing)
☐ Have your representative call.

Name.....
Company.....
Address.....
City.....*State*.....

Production of Accurate Holes

4 Minutes PER GEAR

Hobbing 3½ Pitch Gears



on

BARBER-COLMAN
No. 14-15
HOBBING MACHINE

A heavy cut is required to climb-hob these 3½ Pitch, 5" diameter, transmission gears, and spacing accuracy is especially important for the finishing operation. Three gears per load are hobbed, leaving .015" stock for finishing. Spacing accuracy is held consistently and production averages one load every 12½ minutes.

For that extra accuracy and production capacity in hobbing gears ranging to 3½ Pitch, investigate the No. 14-15 Hobbing Machine.

JOB FACTS

Operation — Climb-hob 3½ Pitch Helical Gears, 5.143" O.D. x 1½", 16T, 3 per load
Material — NE 8825, 179-197 Br.
Hobs — B-C "Multithreads", 5½" x 4" x Taper Bore
Feed — .550"/min.
Speed — 88 RPM
Production — 12½ minutes per load of 3, Fl-to-Fl.
Tool Life — 80 gears per sharpening

A Barber-Colman Sales Engineer will gladly supply cost and production estimates.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 1137 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

METHODS ENGINEERS!
This new catalog on the No. 14-15 Hobbing Machine contains typical examples of actual field performance. Write for copy of Bulletin 1137.

BARBER COLMAN

Norton "Know-How"
Can Cut Your Grinding Costs
1. Research "Know-How"—A staff of over 135 trained scientists and technicians constantly developing new abrasives and new bonds for lower grinding costs.
2. Manufacturing "Know-How"—The largest and most modern grinding wheel plant in the world with its thousands of skilled workers—approximately 10% of whom have been making grinding wheels for 25 years or longer—more than 50% for over 10 years.
3. Engineering "Know-How"—Abrasive engineers the country over—real experts who can come right into your plant and specify the most economical wheels for each of your grinding jobs—wheels that incorporate the cost-cutting advantages made possible by Norton research and Norton improved manufacturing techniques.
NORTON
NORTON
ABRASIVES

AVAILABLE FROM NORTON . . .

Real Abrasive "Know-How" *plus* the *Most Complete Abrasive Service* in the World

Abrasives for Tumbling and Polishing

Grinding Wheels

Segments

Wide Variety

Abrasives for polishing, tumbling and lapping, grinding wheels, segments, discs, bricks and sticks, coated abrasives* and sharpening stones* to meet *all* demands of industry.

Widespread Distribution

Grinding wheel distributor stocks in over 300 cities throughout the world, warehouse stocks in five industrial centers of the United States, factory stocks at the main Worcester plant and at six foreign plants.

Expert Engineering

A Norton field staff of abrasive engineers and Norton factory specialists cooperating with over 2500 distributor representatives the world over.

*Products of Behr-Manning Division

Discs

Bricks and Sticks

Abrasive Paper and Cloth . . . Sharpening Stones

NORTON ABRASIVES

BRANCH WAREHOUSES

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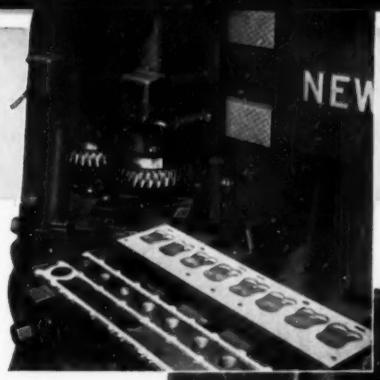
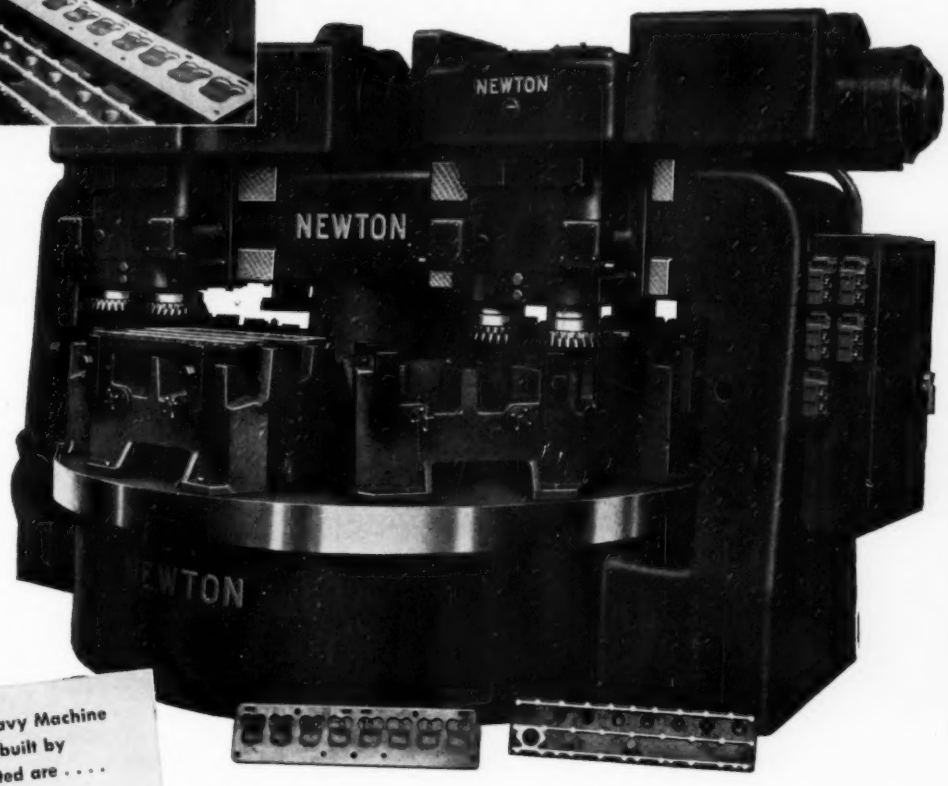


NEWTON EIGHT SPINDLE TWO STATION UNIT HEAD ROTARY CONTINUOUS MILLING MACHINE



Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

Designed for high production milling of automotive cylinder blocks and heads, transmission cases and similar parts, this machine provides new rigidity and power for today's cutting materials. It is equipped with two sets of roughing and two sets of finishing spindles. Operating stations on both sides of the machine make possible twice the productive capacity of the conventional single station machine.

For full information send for Bulletin No. 650

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

INCREASE PERCENTAGE OF GRINDING TIME

with these

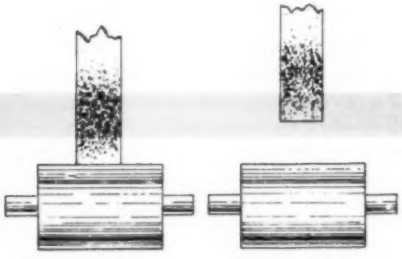
2 ADVANCE-DESIGN AUTOMATIC CYCLE ARRANGEMENTS

THE NEW Automatic Cycle and Spark-Timing Arrangement and the new Automatic Cycle and Sizing Arrangement make Brown & Sharpe Plain Grinding Machines even more productive and versatile. They assure extremely-rapid uniformity of sizing and finish, practically full-time grinding, a minimum of rejects . . . with less effort and attention from the operator.

A UNIQUE FEATURE common to both Arrangements is the *direct-contact wheel-to-work manual infeed* at the start of the cycle. This feature permits larger work tolerances in preceding operations. It eliminates the need of set-ups that favor the high limit of previous turning tolerances. Non-productive time is out . . . no "air-cutting" —net result, appreciably lower overall machining cost.

ANOTHER IMPORTANT FEATURE common to both arrangements is *ease of disengagement*, whereby the machines are instantly available as standard plain grinding machines.

Investigate these new opportunities to reduce your grinding costs still further. Highlights of each arrangement given on opposite page. Arrangements available on all Brown and Sharpe Plain Grinding Machines. Write for complete details. Brown & Sharpe Mfg. Co., Providence 1, R.I., U.S.A.

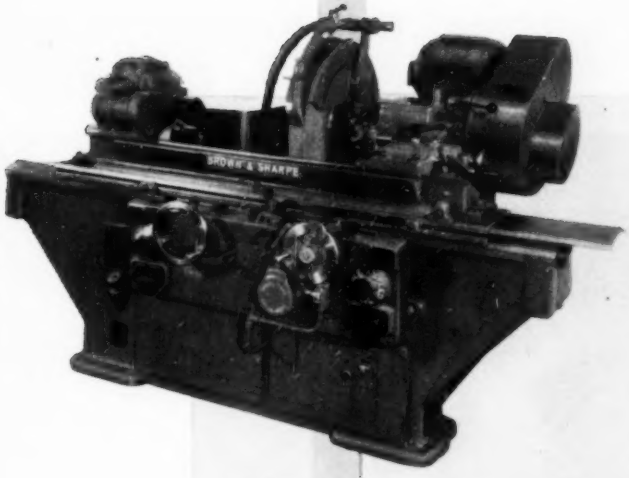


1. Immediate contact with work.

2. "Air cutting" on conventional machines.

These two diagrams show the advantage of Brown & Sharpe infeed over conventional infeeds. 1. Brown & Sharpe infeed brings grinding wheel into immediate contact with work by a continuous smooth sweep of handwheel . . . provides initial grind before cross-feed pawl is engaged. 2. With conventional infeed, wheel must approach work on slow feed.

BROWN &



No. 22 Plain Grinding Machine with Automatic Cycle and Spark-Timing Arrangement.

AUTOMATIC CYCLE AND SPARK-TIMING ARRANGEMENT

On plunge-cut or transverse grinding where uniformity of sizing and finish is essential, this arrangement automatically controls spark time and operation at a predetermined rate (spark time adjustable from 2 to 180 seconds). After grinding is completed, wheel slide withdraws automatically, headstock stops and coolant is shut off. Arrangement used with reciprocating table employs normal amount of spark time allowed for traverse grinding without automatic cycle. Handwheel operation provides positive protection against automatic cycle starting accidentally.

No. 10 Plain Grinding Machine with Automatic Cycle and Sizing-Arrangement.

AUTOMATIC CYCLE AND SIZING ARRANGEMENT

For longer production runs on plunge-cut grinding, where uniform sizing and finish to .0001″ are desired, this arrangement offers maximum output at minimum cost and effort. It automatically sizes from the work—eliminates compensating for wheel wear and effects of wheel truing. After loading and three simple hand operations, cycle is completed automatically. When wheel approaches within .001″ to .003″ (pre-set on work sizing gage) of finish size, cycle changes from coarse feed to predetermined fine feed.

THESE TWO NEW ARRANGEMENTS NOW AVAILABLE on the following Brown & Sharpe Plain Grinding Machines: No. 5—Nos. 10 & 12—Nos. 20, 22 & 23.

SHARPE B·S

There's Nothing Else Like It: USERS GAIN IN PRODUCTION

FORTY-EIGHT per cent savings — floor-to-floor time! That's the actual result on this job — milling the face of worm-wheel housings. *Mono-Lever controlled* reciprocal milling did the trick. Operator determined cycle and set trip dogs — a matter of seconds. Then using the speedy setup and workholding facilities of the Built-in Chucking Table (a new, exclusive Kearney & Trecker development for simplifying setups and for easy holding of irregular shaped workpieces) he made his setup. Then engaged the *Mono-Lever* — and kept busy loading new workpieces.

REPORT 16% TO 96% AND LOWERED COSTS

YOU bet there's nothing else like it! We mean the results users are getting with Kearney & Trecker's *new line of* knee-type milling machines with combined *Mono-Lever* control and Automatic Table Cycle. These users are cost-conscious plants. They know what they're talking about when they report increased efficiency — savings of 16 — 31 — 43 — 96% on all kinds of milling work.

Yes, more and more alert, cost-minded production men are buying these new Kearney & Trecker milling machines. Why? Because they've seen the five important profitable things these machines can do: (1) slash idle cutter time; (2) reduce operator fatigue; (3) improve uniformity of finished work; (4) provide greater adaptability in their shop equipment; (5) *return their investment faster.*

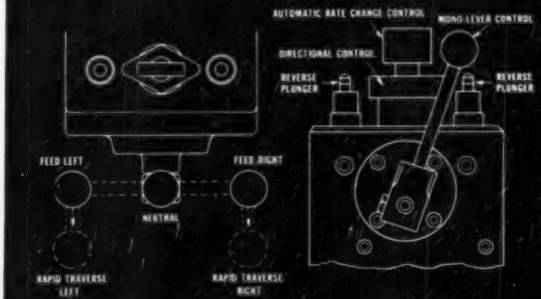
Compare these machines with all others on this important five-point basis. You won't be disappointed!

For some startling facts about these new machines as applied to your milling work, consult a Kearney & Trecker Sales Representative, today. Schooled in the "know-how", he's at your service — or write direct: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

HOW IT WORKS

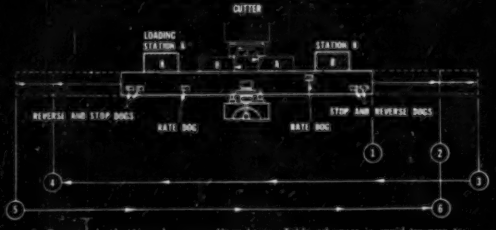
AUTOMATIC TABLE CYCLE and MONO-LEVER CONTROL UNIT



THINK OF IT! Now you can have all the advantages of this great cost-cutting feature plus the all-around versatility of general purpose, knee-type machines . . . faster, easier control for greater production with less operator fatigue.

HOW JOB IS DONE

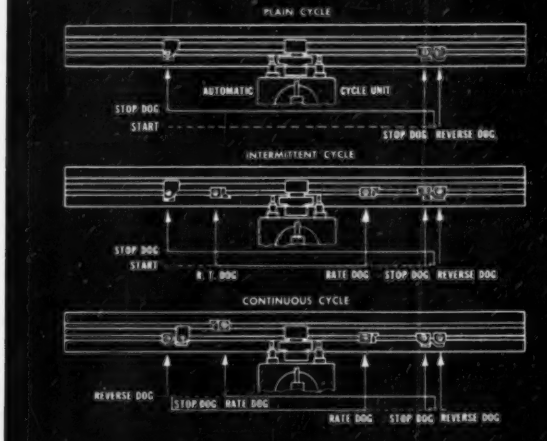
USING AUTOMATIC TABLE CYCLE AND MONO-LEVER CONTROL



1. Operator loads (A) and engages Mono-Lever. Table advances in rapid traverse to point of cut on workpiece (A) at (2).
2. Feed dog changes rapid traverse to selected table feed for cut on (A). Operator loads at station (B).
3. Upon completion of cut stop and reverse dogs reverse table in rapid traverse to point of cut on workpiece (B).
4. Feed dog changes rapid traverse to selected table feed on (B). Operator unloads and reloads at Station (A).
5. Stop and reverse dogs reverse table in rapid traverse to point of cut on workpiece (A).
6. Cycle repeats from (2).

DIAGRAM shows how Mono-Lever control and automatic table cycle does this job. Operator takes approximately 45 seconds to set trip dogs for feed, rapid traverse and reverse. Engages Mono-Lever only once for entire run . . . spends the rest of the time loading and unloading workpieces.

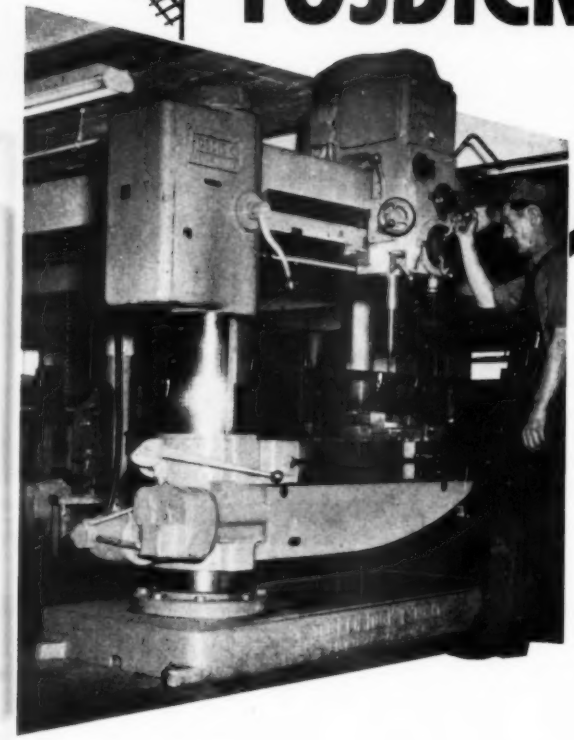
TYPICAL CYCLES YOU CAN USE



THREE DIFFERENT TYPICAL CYCLES to accommodate various job setups. Using the completely automatic cycle feature effects savings of up to 31% for lots of 10 or more pieces. Cycle can be set for loading and unloading time — and can be reversed in feed or rapid traverse.

Fits right into your Production Scheme

FOSDICK Sensitive RADIAL



This shows a Fosdick Sensitive Radial in operation at the Borden Mills Plant, Kingsport, Tenn. You'll find them saving time and costs in plants all over the country from Maine to California, and from Canada to Texas.

◆ ◆ ◆

Our new bulletin gives all the details of construction and fully describes its modern features. Write for the Fosdick Sensitive Radial Bulletin S. R. A.

Because of its high utility factor this machine fills the gap between the large Radial and the Sensitive and Upright Drills. It fits right into the production scheme of both large and small shops.

It has the study construction and flexibility of Radial design plus the high speed characteristics of the Sensitive Drill.

The heavy base construction—the one-piece column—and the adjustable swinging table assure unusual rigidity for sensitive drilling operations. The arm is at a fixed height within easy reach of operator on all jobs. Both table and arm swing in an arc of 360°.

The nine speeds and four feeds are controlled by means of direct reading levers on the head. Thus all operating feeds and speeds are easily attained from the operator's normal working position.

This comparatively new machine is finding its way into hundreds of plants where there are small pieces requiring a number of holes to be drilled. Perhaps it will fit into your production scheme at a cost that is surprisingly low.

FOSDICK MACHINE TOOL Company
CINCINNATI 23, OHIO

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

NEW!

Positive Low-Cost Motor Protection

These new Westinghouse Manual Motor Sentinels (motor starting and overload protection) are available in three types: the Standard (Nema type 1), the Water- and Dust-tight (Nema types 3, 4 and 5), the Explosion-proof (Nema types 7 and 9). These compact, handsomely styled switches start, stop and give positive protection to all motors up to one hp wherever they may be located.

Sensitive, automatic bimetallic element will pass momentary overloads and starting surges, but a dangerous overload will trip the switch immediately to disconnect the motor from the line and save it from damage. Examine these rugged new switches at your nearby Westinghouse distributor or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-30007

EXTRA VALUE FEATURES

POSITIVE ACTION—Bimetallic overload protection assures safe, positive action under serious overloads.

SAFE—No exposed parts. Trip-free switch (can't be held closed against an overload) with self-indicating operating handle.

TROUBLE-FREE—Over-center toggle mechanism . . . quick-make, quick-break, double-break contacts of high-grade silver for long contact life.

ACCESSIBLE—Heaters removable from the front without disturbing any wiring. Switch always remains mounted.

CONVENIENT—Switch unit fits any standard wall box. Straight-through wiring—all terminals are on the front.

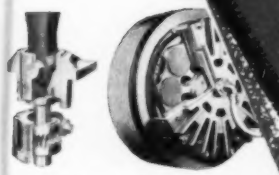
ATTRACTIVE—Sleek, hot-molded switch unit. Standard enclosure is smooth die-casting, baked enamel over Bonderizing. Watertight and explosion-proof enclosures are sturdy cast iron.

Westinghouse

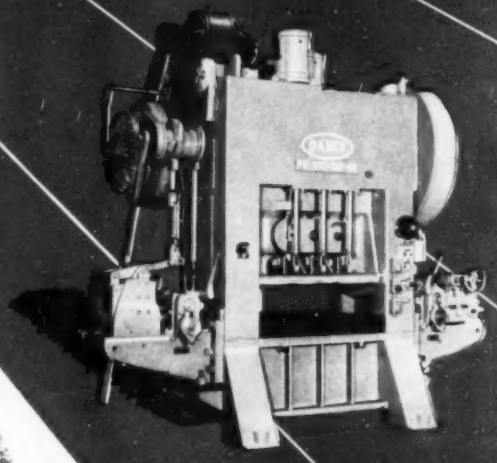
MANUAL MOTOR STARTERS

DANLY PRESSES

1. new design features
2. extra rugged construction
3. record-breaking performance



LEFT—Cut-away view of special Danly pitman wrist pin design showing guide construction. RIGHT—Cut-away view of Danly Clutch showing long wearing, easily replaced friction discs.



THE NEW AUTOMATED . . . Uninterrupted high volume production is a must in the large electrical manufacturing plant where this newly designed press is in operation. Higher capacity in both tonnage and speed, with fully automatic stock feeding, makes this the truly modern press for high speed production stamping. Costly press downtime is greatly reduced because of substantially greater frame rigidity which reduces vibration at higher operating speeds. For this reason your dies last longer between grinds. Available from 50 to 800 tons in extra heavy construction.

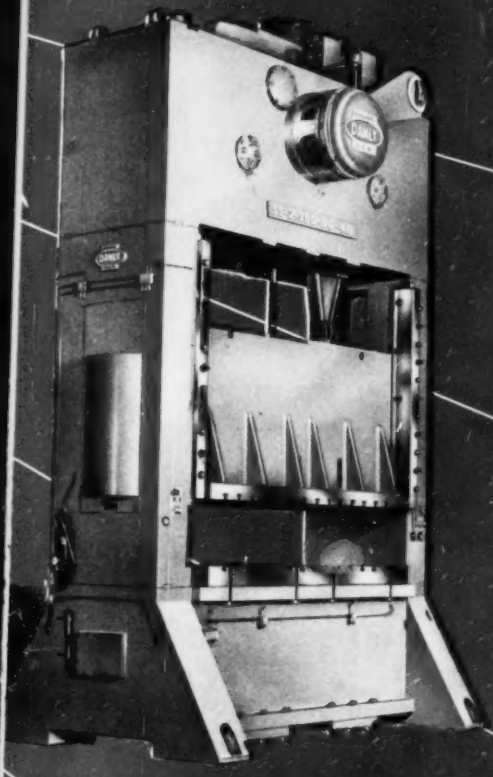
1. New Design Features . . . Press engineering achievements like the Danly "low inertia" clutch, positive automatic lubrication, special pitman wrist pin design and sensitive electrical controls assure ease, economy and continuity of operation.

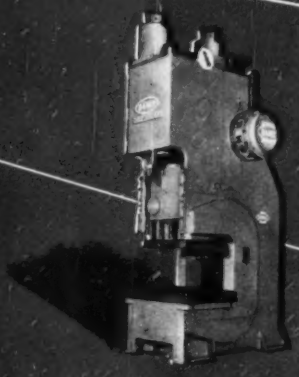
2. Extra Rugged Construction . . . Special structural features like the extra heavy stress relieved frame weldments, oversized tie-rods and bronze lined, fully adjustable gibs make every Danly Press more rugged . . . to withstand the continual abuse of 24 hour, 7 day week operation.

3. Record-breaking Performance . . . The exclusive Danly "low inertia" clutch alone minimizes the most troublesome source of press maintenance cost and work stoppage because it out-wears conventional type press clutches 10 to 1! A greater proportion of the clutch assembly mass revolves continuously with the flywheel to reduce the clutch "pick-up" load. Thus, less heat is generated. Forced air circulation contributes further to cool operation.

"IT COSTS LESS TO RUN A DANLY PRESS"

are better 3 ways!





GAP FRAME . . . This 200 ton Danly Gap Frame press shows how modern eccentric gear construction permits a compact, closely coupled drive. As a result, drive members are more rigid and wear longer. Other types include inclinable presses, undercrank presses, and special welding presses. Whatever your mechanical press requirements, you can have the advantages of the exclusive Danly construction and engineering features.

STRAIGHT SIDE . . . This new single action press was recently installed in a leading automotive manufacturing plant to help reduce stamping costs. Presses are available from 50 to 3000 tons with one, two or four point suspension and single, double or triple action. All of the special Danly features . . . plus engineering to meet your press requirements . . . assure you that a Danly Press will do your job faster and more efficiently.

Check these advantages and see how DANLY PRESSES can cut your production costs.

- ✔ greater rigidity . . . the entire frame is constructed to minimize deflection and vibration at rated capacity.
- ✔ less downtime . . . positive lubrication, longer clutch life and increased accessibility of brake and clutch components subject to wear are only a few of the features that make Danly Press maintenance less frequent and less costly!
- ✔ precision construction . . . balanced rotating parts and precision machined guides reduce wear and assure accurate die closure.
- ✔ extra sensitive controls . . . special five position clutch controls with built-in safety features facilitate die tryouts and protect the press mechanism.

We will be glad to arrange a detailed discussion of the savings DANLY PRESSES can achieve in your specific application. Write today!

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MECHANICAL PRESSES . . . 50 TO 3000 TONS

DANLY MACHINE SPECIALTIES, INC. 2100 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

Finish Intricate Parts
Quickly and Economically–
with Precision Tumbling
and ALUNDUM Abrasive!
YOU can remove objectionable heat scale, burrs, tool marks and dirt from your metal parts, and can improve their finish and prepare them for subsequent plating—ALL IN ONE OPERATION—with precision tumbling and ALUNDUM Tumbling Abrasive!
By taking advantage of precision tumbling and ALUNDUM Tumbling Abrasive you can eliminate the danger of pitting the surface of the parts with acid dip methods—eliminate slow, expensive polishing operations—and obtain cleaner, better-surfaced parts quickly and far more economically. For full details on the precision tumbling process and ALUNDUM Tumbling Abrasive, contact your Norton abrasive engineer or distributor, or write for a free copy of "Precision Tumbling with ALUNDUM Abrasive".
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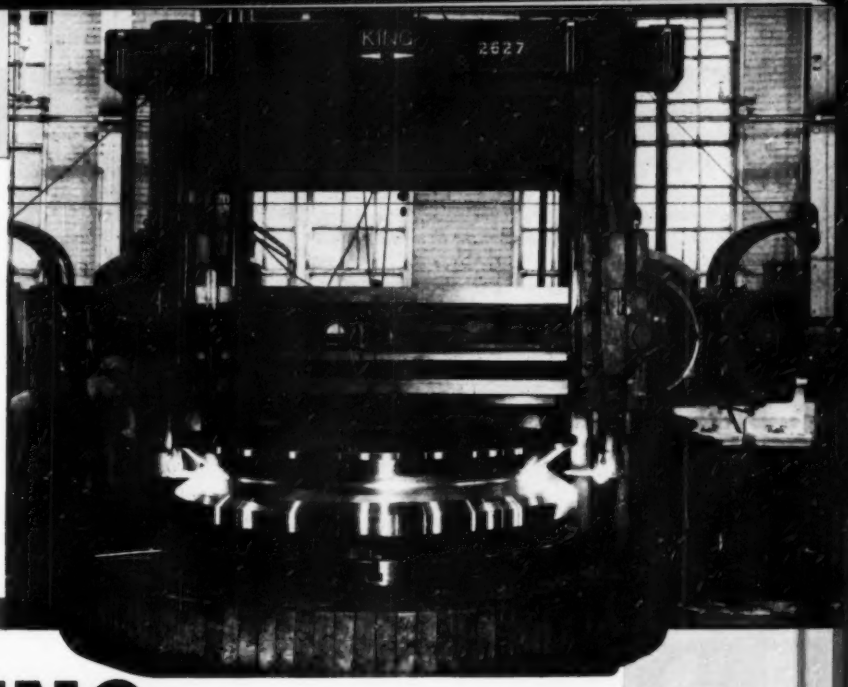


New Series 100" KING Vertical Boring & Turning Machine turning the groove of a 91" diam. cable sheave for a large Marion Power Shovel. The cable groove is 4½" deep and 6½" wide at the top. Width of rim is 9". The sheave has a 14" long hub having a 14½" diam. bore which is machined to a tolerance of +.000" —.001".

KING *Saves 20 to 30% Over Previous Time*

SAYS MARION POWER SHOVEL

Officials of the Marion Power Shovel Company, Marion, Ohio, report the following facts about their New Series 100" KING:

- ✓ **"Accuracy obtainable on this machine makes it possible to machine bores to close tolerances as required for roller and ball bearings used in sheaves, gears, and gear cases.**
- ✓ **"High speed and rigidity make it ideal for use with tungsten carbide.**
- ✓ **"20% to 30% time is saved by the use of the King Mill as against previous methods."**

This prominent manufacturer of heavy excavating machinery schedules a wide variety of work on this New Series KING. Various types of weldments and castings are machined, including spur and bevel gears and gear cases; yoke frames; sheaves up to 100" o.d. with grooves for 2" to 3" cable; and cable drums, 88" o.d. by 64" high, weighing as much as 16,000 pounds. This example provides further proof of the power, rigidity, range and flexibility of operation built into KING Vertical Boring & Turning Machines.

If you want to cut costs and improve quality on your boring, turning and facing work, it will pay you to investigate the New Series KING. Consult a King engineer — there is no obligation.

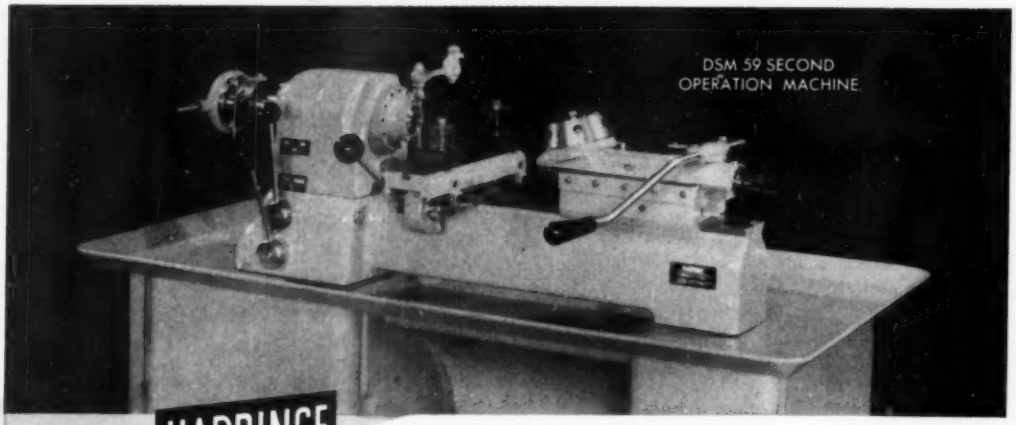
10 SIZES ***One head on rail, 30" and 36". One or two heads on rail, 42", 52", 62", 72", 84", 100", 120", and 144". All available with or without side head and in a variety of head combinations.***

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes



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ELMIRA, N.Y.

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HARDINGE high speed precision machines are matched with interchangeable attachments to step up precision production in your tool room, laboratory, and development departments. For example, all spindles take standard **5C HARDINGE** 1" capacity collets, including the spiral or plain index centers for the milling machines.

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HP MULTI-OPERATION CHUCKING MACHINE

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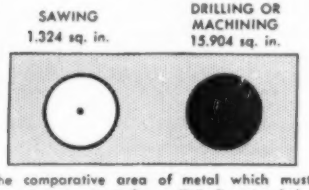
Hughes Owens Co., Ltd., Montreal

HEAVY DUTY HOLE SAWS
for... Shop and Production Use.

A heavy duty type hole saw, which may radically change present shop practice for cutting large holes in steel or other machinable materials up to 1" thick, has been developed by the Armstrong-Blum Manufacturing Company of Chicago, who also build MARVEL Metal Sawing Machines and MARVEL High-Speed-Edge Hack Saw Blades.

These hole saws are designed for general use, not only in all types of portable power tools, but in drill presses, lathes and other standard machine tools. They reduce the cost of cutting large holes by saving setting up time, reducing machining time and lowering tooling and power costs. These economies result from the basic operating principles of a hole saw — the removal of a large core by making a narrow peripheral cut. For example, a 4½" hole with an area of approximately 16 square inches, can be sawed out with a hole saw by cutting away only 1⅓ square inches of metal.



The comparative area of metal which must be cut away to make a 4½" diameter hole

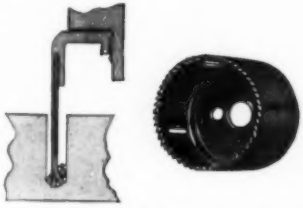
Added to the peripheral cutting principle, the "gang tool" cutting efficiency of a hole saw (a 4½" hole saw has 85 cutting teeth) *enables small capacity machine tools to cut large size holes.* A ½" portable drill can cut a 4½" hole thru ¼" steel plate in one minute. Compare this method with the ordinary practice of first, drilling a starting hole, second, setting-up a lathe or boring mill, and third, machining the hole, "a-chip-at-a-time."

BASIC DIFFERENCES IN HOLE SAWS

Hole saws are basically of two types: ordinary hole saws and MARVEL High-Speed-Edge Hole Saws. Ordinary hole saws have long been used by sheet metal workers and appliance installers for cutting holes thru sheetmetal, wallboard and other light gauge, soft material.

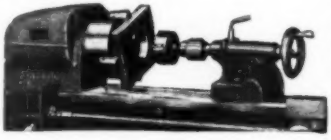
MARVEL High-Speed-Edge Hole Saws, on the other hand, were developed and designed specifically to broaden the usefulness of these tools. These uses include cutting holes in every type of machinable material to a depth of 1", as well as the usual applications. They are manufactured in sizes ranging from ⅝" to 4½" in diameter in steps of ⅛".

In order to be useful for such a wide variety of applications, a hole saw *must* have many exclusive and unique features. Due to the peripheral speed developing intense heat, a high speed steel cutting edge is essential. Furthermore, because hole saws are subjected to severe use and rough handling, the tool must be practically indestructible. MARVEL Hole Saws are made from the same materials used in the manufacture of the famous MARVEL Unbreakable High-Speed-Edge Hack Saw Blades. High speed teeth are welded to a tough, chrome vanadium body. In other words, the teeth can withstand extreme heat, will cut anything which can be cut with a high speed steel tool, yet they are unbreakable, due to the tough body which backs up the high speed steel teeth. To permit sawing deeper than the gullet of the teeth of the saw, chip clearance must be provided.

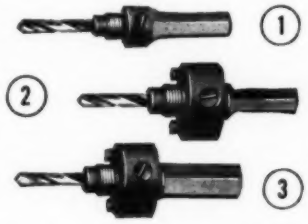


This is accomplished in MARVEL Hole Saws by a special method which produces an exclusive type of set. In every three teeth, one is set extremely to the inside, the next one straight and one slightly to the outside. The reason for the latter is to prevent binding of the saw in the cut, yet assuring fairly constant diameter during the life of the tool.

A tool which will withstand all demands imposed upon it requires an equally good arbor for the drive. MARVEL Hole Saw Arbors are all made from a solid bar of special alloy steel. One end is milled to a hexagon shank which will fit any ½", or larger, two or three jaw chuck. A special ¼" high speed steel pilot drill is furnished with each arbor. This pilot drill is held in the arbor by a set screw which contacts the drill at a 5° angle. To assure a positive lock, immune to the tendency to twist loose, the drill has a flat ground into the shank, also at a 5° angle. This method of holding the drill does not require undue stress on the jaw of the chuck to keep the pilot drill from turning in the arbor.



Only two arbors are required for the entire range of sizes, Numbers 2 and 3 being identical except for shank dimensions. These larger arbors, which are used on hole saws from 1¼" to 4½", incorporate a rugged, foolproof drive. The hole saw fits onto a ⅝" thread, but the thread does not carry the load of the drive. In the body of the arbor are two drive pins. These drive pins fit into two holes in the top



of the hole saws. In order to register the drive pins with the saw holes, it is necessary to back up the saw after it has contacted the shoulder of the arbor. When the drive pins are in place, the saw is provided with a positive, dual but flexible drive. This drive relieves the saw and pilot drill of undue strain by allowing a certain amount of "universal joint" movement. This is especially advantageous when the saw is used in portable power tools. The drive pins are not loose parts but are permanently fastened to the arbor and cannot be lost.

The No. 1 Arbors which accommodate hole saws from ⅝" to 1¼", do not have drive pins, as on the smaller sizes this arrangement is unnecessary. The body of the smaller saws is welded to a hexagon back and removal of the hole saw is easily accomplished by clamping the hexagon shank in a vise and using a wrench on the hexagon part of the saw.

Occasionally it is difficult to use a hole saw because the body of the power tool prevents getting into close quarters or near to the work. To overcome these conditions, the No. 7 Extension is available. This handy extension is 12" long and fits over both the No. 1 and No. 2 Arbor, permitting the hole saw to be used that distance away from the power source.

Complete instructions for proper use of MARVEL Hole Saws — correct speed, lubrication and application — are packed in each standard package of ten saws. Bulletin ST-49 contains full description, illustrations and list prices and is available for the asking. Write for your copy today to Armstrong-Blum Mfg. Co., 5700 Bloomingdale Avenue, Chicago 39, Illinois.

MARVEL Metal Cutting SAWS
Better Blades Make Better Work

3 MORE REASONS WHY

NAMCO CIRCULAR CHASER VERS-O-TOOLS CAN CUT YOUR THREADING COSTS

FASTER—SIMPLER—ACCURATE

Part—Valve Stem; threaded section 1" x 5".
Material—A-1140 Steel.
Vers-O-Tool—Standard 2⅜" Type DS, cutting 4 pitch thread.
Former Method—On turret lathe using lead screw, required 4 passes—box milling, two roughing threading cuts and one finish threading cut.
Vers-O-Tool Method—On same turret lathe with ground thread circular chasers made with extension pilots, requires one roughing cut, permitting lead screw to disengage after first 4 threads, and one finishing cut performed same way.
Result—Smoother threads, cut to lead screw accuracy in only *two passes*—a substantial saving in time and tool investment.

CLOSE TO SHOULDER—20,000 PER GRIND

Part—Small Adjusting Screw $\frac{3}{16}$" long; No. 0-80 U. S. Pitch Thread.
Material—A-1112 Steel.
Vers-O-Tool—Standard ¼" Type DBS, on No. 0 Brown & Sharpe Automatic.
Lot Size—100,000 three times a year. Even with exacting requirements for fine finish and close fit, production averages 20,000 between regrinds of circular chasers.
Design Advantage—DBS Vers-O-Tool provides a very sensitive adjustment between shank and body for starting the thread; quick-opening action permits threading close under head—within 1½ threads.

CLASS 3 THREAD—125,000 PER GRIND

Part—Bushing; A. N. Fine ½"—20 thread.
Material—B-1113 Steel.
Vers-O-Tool—Standard $\frac{3}{16}$" Type DR, on 1" RA Acme-Gridley Automatic.
Result—Class three thread; in excess of 125,000 pieces between regrinds of circular chasers.

For thread cutting of finer finishes—*faster*—there's a standard Namco Circular Chaser Vers-O-Tool to fit your requirements. Complete range of sizes and types shown in Bulletin D-49. Ask for your copy.

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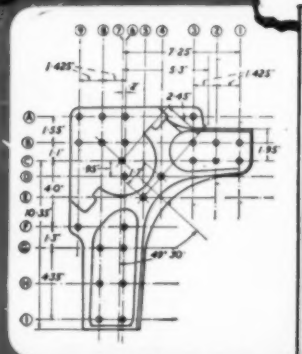
BULLARD SPACER *Goes Abroad*

The de Havilland Aircraft Co., Ltd., are getting good results with a Bullard Man-Au-Trol spacer unit which they are now using in conjunction with an Asquith O.D.I. radial drilling machine in their Hatfield works. By eliminating jigging or marking out in the drilling of a large range of components produced in comparatively small batches, the spacer has cut costs and speeded production. Fig. 1 shows the Asquith radial drill equipped with the spacer unit in the de Havilland factory. It is set up on a comparatively small job for a table of this size, but its versatility may be claimed as an advantage of the device, for it will deal equally well with any work within its capacity. Peacetime production of aircraft obviously calls for a good deal of comparatively small batch work. At de Havilland's they have tooled up extensively for production of their Dove aircraft of which they have sold a large number. But others of their machines are going through in small lots, prototypes and "pilot" production. For this class of work involving machining a few off of widely different components, the company are already satisfied that the Man-Au-Trol spacer unit offers interesting possibilities. It has the advantage, too, that it will work to quite close limits — the makers claim an accuracy of 0.001 in. in spacing.



Coordinates of the various holes are shown superimposed on this drawing of the component. Each hole is identified by one letter and one number for setting on the handwheels.

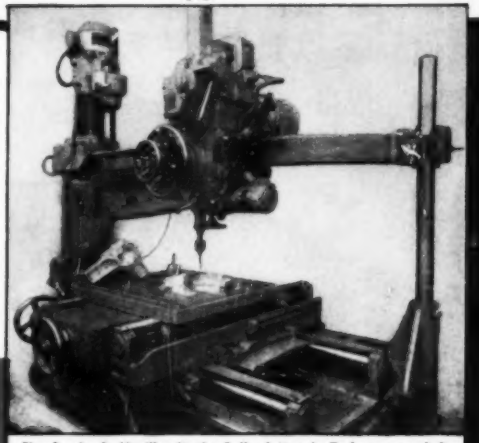


Fig. 1.—At de Havilland's the Bullard Man-Au-Trol spacer unit is mounted on an Asquith O.D.I. radial drill, the arm of the machine being secured by a clamp to an outer supporting column mounted on the base.

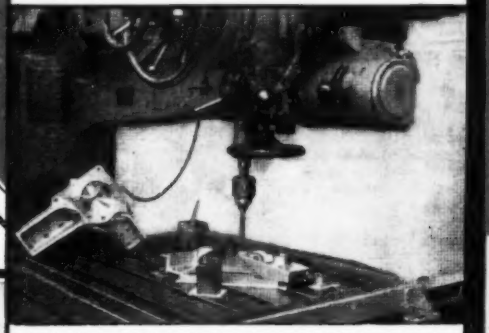
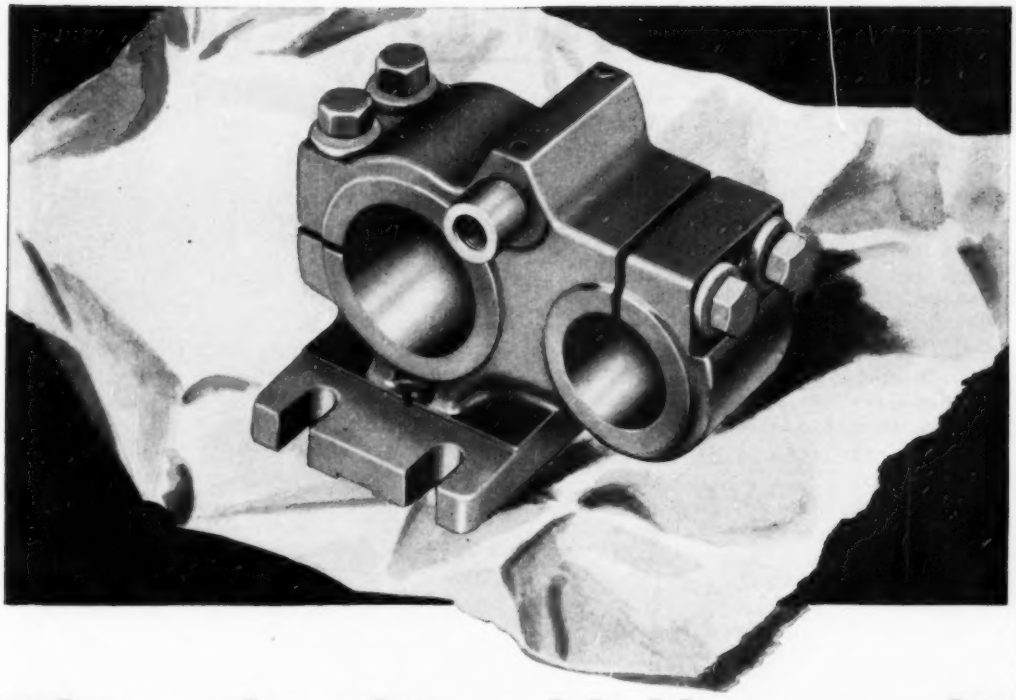


Fig. 2.—Close-up of the table, showing a typical job clamped to the surface ready for drilling. A completed component is also shown on the left of the photograph.

Performance and Efficiency prove the Bullard Spacer to be a Profitable Investment.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT



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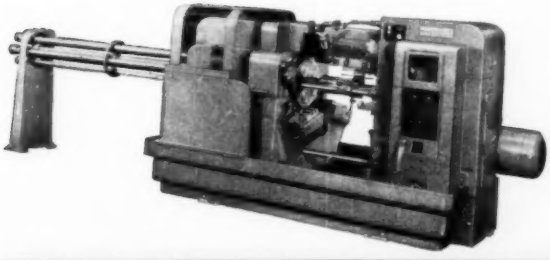
This Tool Holder will fit *any position* on *any* Warner & Swasey 5-Spindle Automatic.

All Warner & Swasey Tool Holders are *interchangeable* from position to position and machine to machine.

This interchangeability means smaller tool inventory, quicker setups and greater flexibility.

Call your nearest Warner & Swasey Field Representative to find out how *your* costs can be cut—or write



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Cleveland

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

Kelvinator buys more CLEVELANDS

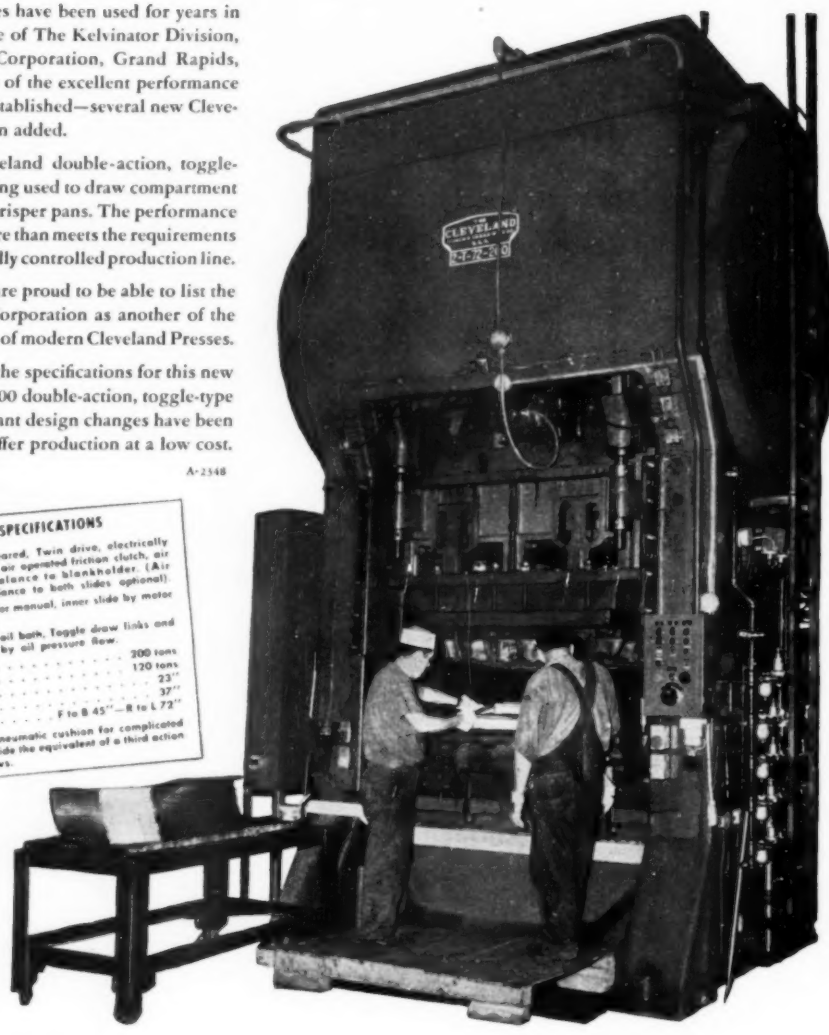
Cleveland Presses have been used for years in the production line of The Kelvinator Division, Nash-Kelvinator Corporation, Grand Rapids, Michigan. Because of the excellent performance record they have established—several new Clevelands have just been added.

These new Cleveland double-action, toggle-type presses are being used to draw compartment doors, panels and crisper pans. The performance of these presses more than meets the requirements of Kelvinator's rigidly controlled production line.

We at Cleveland are proud to be able to list the Nash-Kelvinator Corporation as another of the many satisfied users of modern Cleveland Presses.

Listed below are the specifications for this new Cleveland #2T-72-200 double-action, toggle-type press. Many important design changes have been incorporated that offer production at a low cost.

A-2348



CONDENSED SPECIFICATIONS

Operation: Double geared. Twin drive, electrically controlled air operated friction clutch, air counterbalance to blankholder. (Air counterbalance to both slides optional)

Adjustment: Blankholder manual, inner slide by motor up to 5".

Lubrication: Gears in oil bath. Toggle draw links and bearings by oil pressure flow.

Capacity inner slide	200 tons
Capacity blankholder	120 tons
Stroke of inner slide	23"
Shut height with adj. up	37"
Bed area	F to B 45"—R to L 72"

Equipped with 35 ton pneumatic cushion for complicated deep drawing or to provide the equivalent of a third action for shallow reverse draws.

For complete information send for our folder 94. If you require presses for a special metal forming problem, feel free to call on our experienced engineers for consultation.

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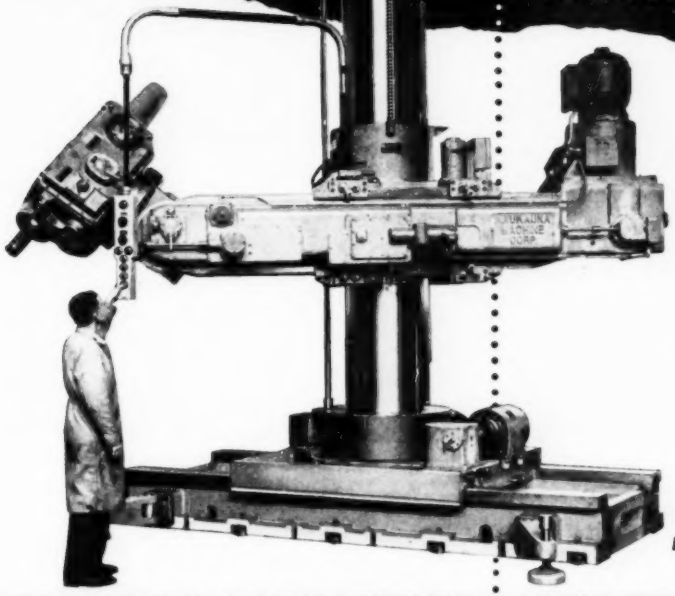
MOVE THIS

New Portable Drilling and Tapping Machine

TO YOUR WORK



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- Compressors and pump bodies.
- Turbo-generator parts.
- Hydraulic and mechanical press members.
- Heavy-duty rock crushing equipment.
- Mining machinery.
- Power shovels and drag lines.
- Large steam boilers.
- Locomotive frames, cylinders and similar parts.
- Steel fabrications, supporting structures and bridge beams.

MODEL 140-U *Universal Portable Machine for heavy-duty service*

END EXPENSIVE SETUPS—SAVE WORK HANDLING TIME —KAUKAUNA UNIVERSAL MACHINE PERFORMS OPERATIONS AT ANY ANGLE FROM A SINGLE POSITION . . .

Here is a full universal machine that performs heavy-duty drilling, tapping, boring and spot facing operations at practically any angle—from practically any location! The 4-inch spindle of this machine may be readily swiveled in the horizontal or vertical plane and at any compound angle desired. This unusual flexibility coupled with portability makes it highly practical to move the machine to large, cumbersome work instead of moving hard-to-handle and hard-to-set up work to the machine.

Production and assembly costs are substantially reduced on massive complex parts because of the portability of this new Kaukauna Universal Machine.

MULTIPLE MACHINE MOVEMENTS QUICKLY PRESENT SPINDLE TO WORK, REGARDLESS OF POSITION . . .

Regardless of surface to be bored, drilled, tapped or spot faced, the new Kaukauna No. 140-U Universal Machine can be moved by overhead crane to the work area. Precision leveling is unnecessary. Various machine movements compensate for uneven floors. Important machine movements include: (1) Power swiveling of the headstock in the horizontal plane through 360° and vertical plane 180°. (2) Power and hand traverse of the spindle. (3) Rapid power traverse to the rail. (4) Column, rail and headstock move under power as a unit on the machine runway. (5) These machine elements readily rotate on the column base duplicating the arm movement of a radial drilling machine.

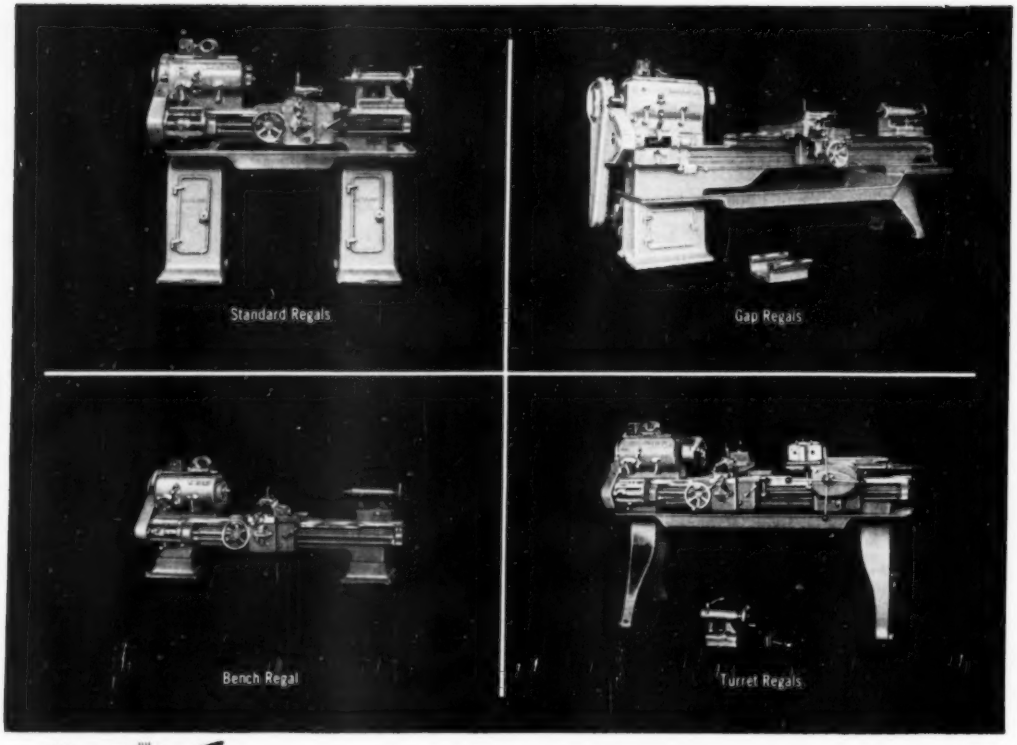
When you need a practical machine to solve unusual jobs and wish to *double up* with the same machine for run-of-the-shop work, call Kaukauna engineers. These men will be glad to tackle your problem now at no obligation to you.

KMC

Kaukauna MACHINE CORPORATION

KAUKAUNA, WIS., U.S.A.

Kaukauna Machines Move to the Job



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Keeping big steam and deisel ships underway thousands of miles at sea is a job LeBlond Regals are doing every day on board the vessels of many important shipping lines. These versatile metal turning lathes are powerful, compact, and reliable. They're available in bench, floor, gap, and turret models.

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LeBLOND ALSO MAKES

Heavy duty engine, tool room, Dual Drive, automatic, Rapid Production, gap and sliding bed gap, hollow spindle, universal and automatic crankshaft and special purpose lathes and cutter grinders.

LeBLOND

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LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES.
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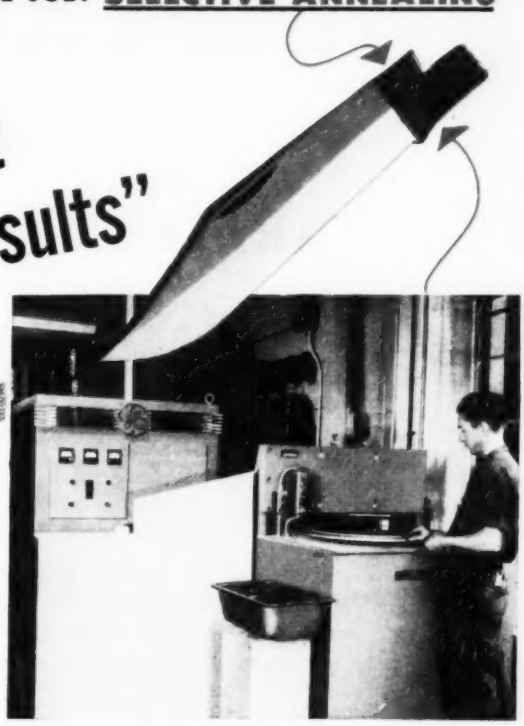
better product lower unit cost "unparalleled results"



"HEAT TREATING RESULTS

never before possible with stainless steel blades are now being accomplished," according to W. R. Case & Sons Cutlery Company, Bradford, Pa.—thanks to their 120-kw G-E Rotary Hearth Furnace and 20-kw G-E Electronic Induction Heater.

Prior to this installation, chrome-vanadium steel blades were hardened in a lead bath. Stainless steel blades, however, called for new heat treating methods with some means of annealing just the tang of the blades.

With a 20-kw G-E Induction Heater it is now possible to anneal only the tang on stainless steel and chrome-vanadium steel blades. For example, medium-size, stainless-steel, pocket-knife blades are annealed after hardening at the rate of 1440 an hour and at a direct cost of only $0.07 per gross!

After the blades have been hardened in the G-E Rotary Hearth Furnace, under protective atmosphere, an operator places them on an automatic handling fixture. The fixture carries the blade around so that the tang only passes through the hairpin-shaped inductor coil. Thus the line of demarcation between the annealed tang and the hardened cutting portion of the blade can be held so close it is even possible to anneal the tangs of blades which have already been finished.

Net result: a better, more uniform product at lower unit cost—thanks to induction heating.

Electronic INDUCTION HEATERS

YOUR PRODUCT AND INDUCTION HEATING

If your production involves brazing, soldering, hardening, or annealing, be sure to get in touch with the Heating Specialist in the nearest G-E Office. His suggestions are very likely to result in higher production, lower cost and better products, as they have for so many other manufacturers. In the meantime, send for free bulletin GES-3290, "The How and What of Electronic Induction Heating." ***Sect. 720-6, Apparatus Department, General Electric Company, Schenectady 5, N. Y.***

You can put your confidence in—

GENERAL ELECTRIC

ARMSTRONG

ARMALOY

Drop Forged

WRENCHES

ARMSTRONG ARMALOY — Wrenches are NEW. They are designed to meet the requirements of the mechanic who knows his tools and insists on using tools of Superior Quality.

ARMSTRONG ARMALOY — Wrenches are made from selected grade alloy steel. They are longer, lighter, thinner, yet stronger than the conventional alloy wrenches—heat treated to exact specifications of stiffness and tensile strength—better balanced, hence easier to use. Finished in chrome plate with heads buffed bright.

Armstrong Tools are stocked by leading tool departments.

Combination

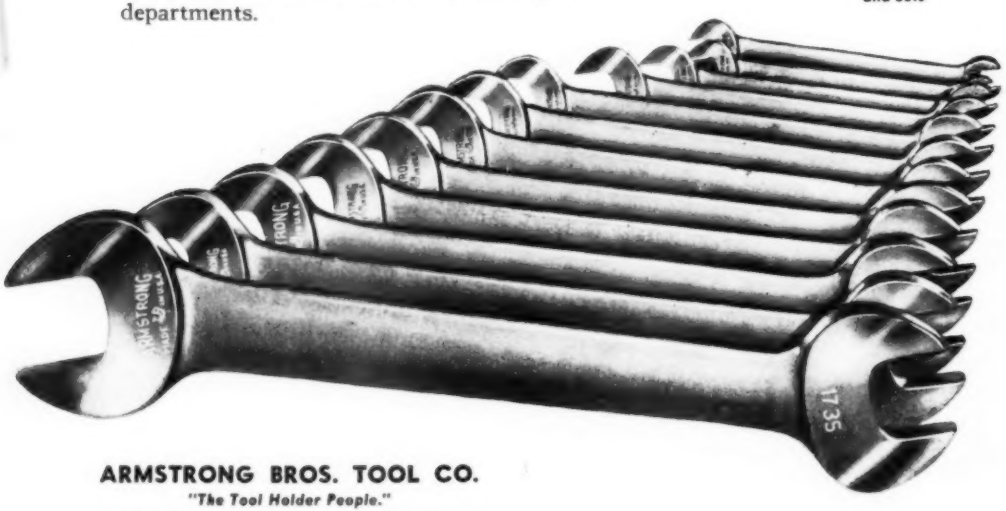
Box Socket

Construction and Structural

Hex Box

Reversible Ratchets

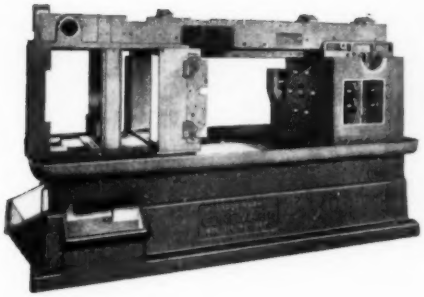
Detachable Sockets and Sets



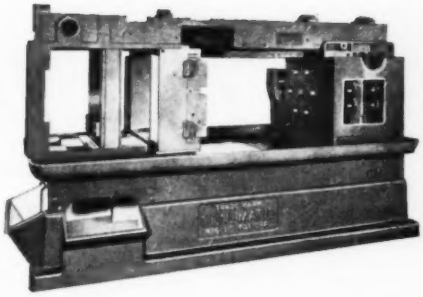
ARMSTRONG BROS. TOOL CO.

"The Tool Holder People."

5215 W. Armstrong Ave. Chicago 30, Ill.



2⅝" 6-Spindle
CONOMATIC
FRAME



Heavy, Massive

ARE YOU

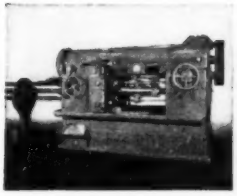
Weight — 12,446 pounds
Floor Length — 127"
Floor Width — 50"
Height — 71 11/16"
Height of Base Support—34"
(Full information available)

SUBJECT TO WITHHOLDING?

The withholding of information regarding the facilities of machine tools would be unintentional. But the use of generalizations and approximations, instead of specifications, actually is withholding. Generalizations fail to establish the superiority of a machine's facility through terms which lack a definite basis of comparison. They leave an impression of doubt as to tangible substantiation.

There is nothing definite about a "roomy" tooling area; nothing specific about a "rugged" tool slide, and nothing comparative about a "massive" frame.

The dispensing of machine information is the responsibility of the manufacturer. Realizing this, CONE has prepared an analysis chart that should prove very useful to those seeking more specific information about multiple spindle automatic bar machines. Your copy is free. There is no obligation.



A comparison with ALL Automatics will lead you to

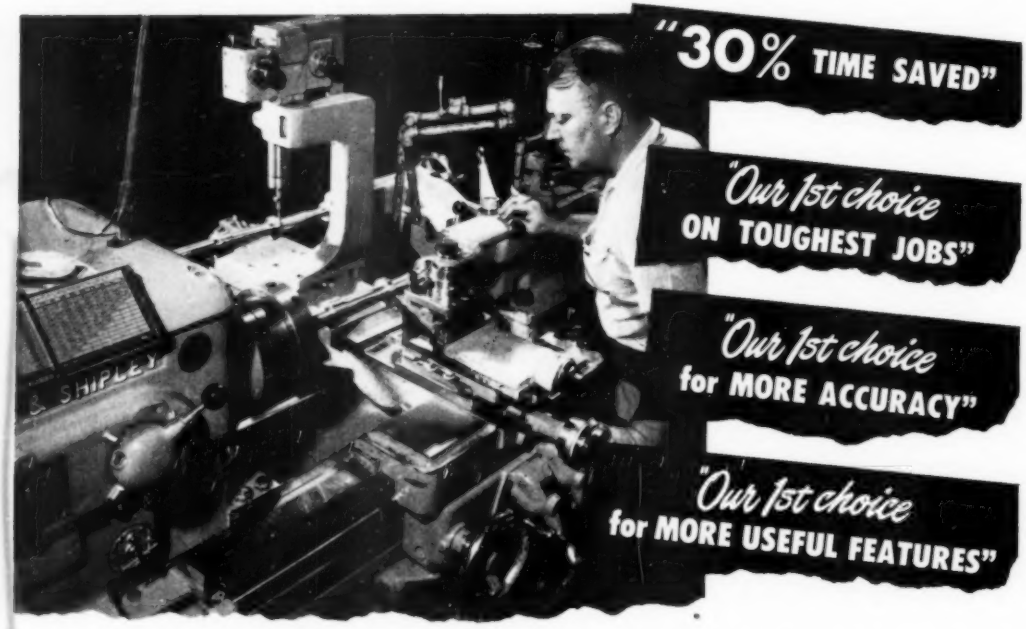
Conomatic

CONE AUTOMATIC
MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

NEW LODGE & SHIPLEY COPYMATIC

"Our 1st choice"

SAYS OTIS ENGINEERING CORP.



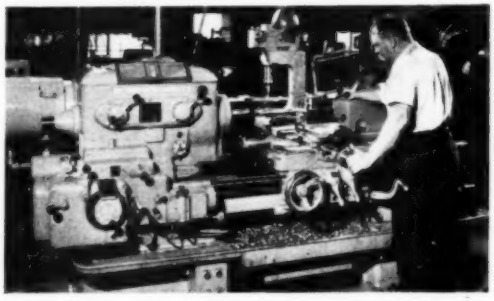
DUPLICATE PARTS OR DO REGULAR LATHE WORK . . . get instant changeover *ONLY* with the *COPYMATIC!*

When a leading maker of oil field pressure control equipment reports performance like that above, it indicates more than a satisfied customer. This praise reflects the enthusiasm of Otis Engineering Corp., Dallas, Texas, after comparing the Copymatic with other lathes used "on the toughest jobs in their shop."

In the illustrations an OTIS bottom hole choke mandrel is being automatically reproduced from monel metal, using a carbide-tipped tool at 665 rpm and .0059" feed. An actual 30% is cut from the time formerly required for this job. Operations performed include: turning, boring and threading.

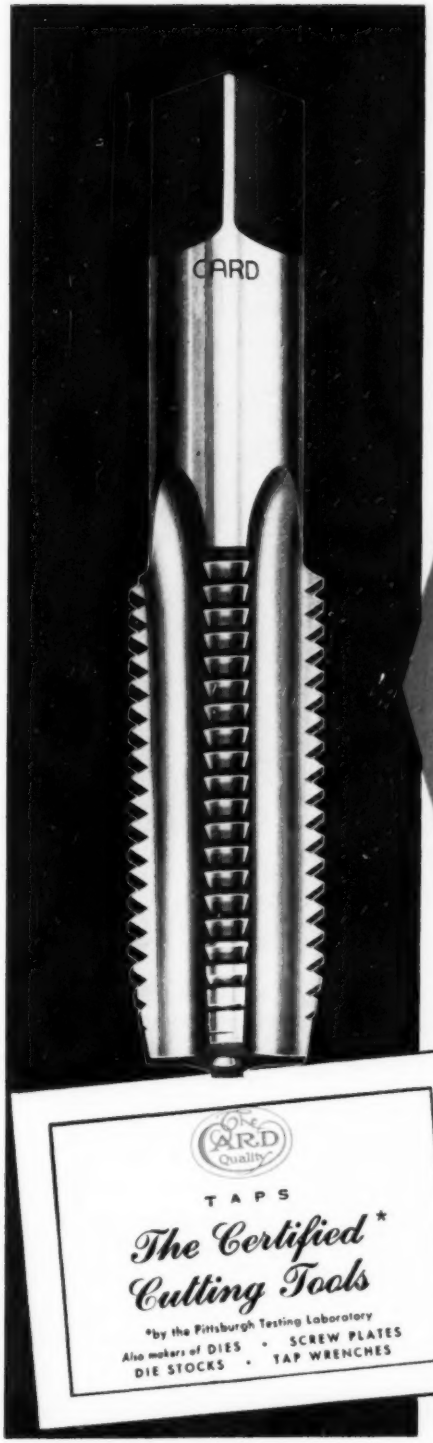
A Lodge & Shipley COPYMATIC Lathe can speed and improve your turning operations too! Using round or flat templates, the COPYMATIC accurately duplicates square shoulder faces, grinding necks, tapers in both directions, chamfers and curved contours. Often a special template is eliminated; the first piece is turned by using the machine as a standard lathe, inserted as a template and the machine switched over to automatic operation *instantly* . . . for the production of the rest of the lot.

Let a Lodge & Shipley Representative show you how the COPYMATIC gives the *versatility* of the engine lathe, *productive capacity* of automatic duplication (with instant change-over) *without the* limited use and high cost of a special purpose machine. Write for Bulletin No. 675.



THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

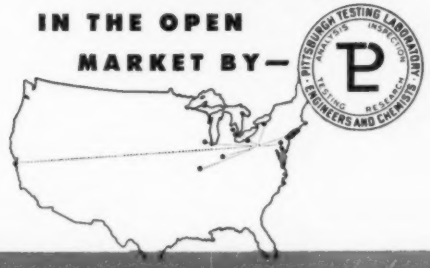


FIRST CHECK

IN CARD'S FACTORY
MANSFIELD, MASS.

DOUBLE CHECKED

BY RANDOM SAMPLE
IN THE OPEN
MARKET BY—



*Only Card Taps Are CERTIFIED**

Card's refusal to "take a chance" on quality is one big reason why metal workers rely so confidently on Card cutting tools.

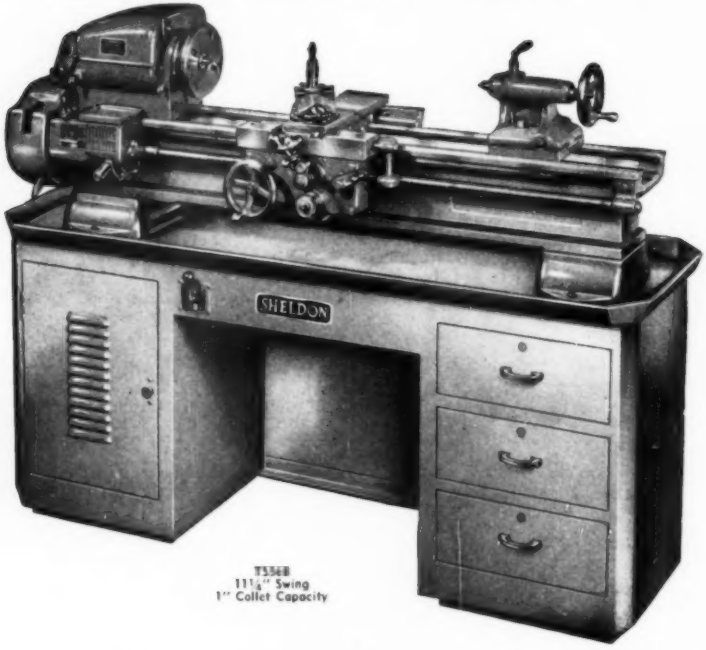
Recognizing the need for a truly *objective* test of its products, Card retains the famous Pittsburgh Testing Laboratory to buy Card Taps periodically *anywhere it pleases on the open market* . . . put them through severe tests to make *absolutely certain* that they meet the highest standards. These taps are then CERTIFIED* as meeting proper specifications.

You'll find Card Certified* Taps and fast, dependable service at your nearby Card Distributor. Contact him for real savings in time and money.

S. W. CARD

MANUFACTURING COMPANY
Mansfield, Massachusetts
DIVISION OF UNION TWIST DRILL COMPANY

SHELDON



T356B
11¼" Swing
1" Collet Capacity

Accuracy is a matter of Tolerances *not Size*

There may have been a time when to be accurate a lathe had to be massive, cumbersome and expensive. That is not true today.

Accuracy is essentially a matter of tolerances not mass, and today the very finest of spindle bearings (Timkens Zero Precision Tapered Roller Bearings—run out accuracy within .00015) are found on SHELDON Precision Lathes. Beds of these 10", 11" and 12" SHELDON Lathes are held to within .0005" per foot of both parallel and longitudinal alignment while the lead screws are held within a tolerance of lead error of .0005" in any inch. Rigidity is obtained by improved engineering—by placement of mass rather than sheer bulk.

Advances in machine tool building art, special machines, jigs and fixtures produce uniformly excellent SHELDON Precision Lathes in quantities that permit low selling prices. Larger collet capacities and increased power at the cutting point enable these more-profitable-to-operate lathes to take over much work heretofore requiring larger and more costly equipment.

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

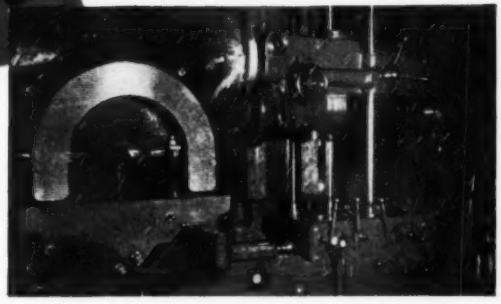
4234 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

4" Universal Boring Machine boring 3" Discharge Centrifugal Pump.

CALL IT *User Preference* for UNIVERSAL

NOW . . .

BULLARD - *Universal* BORING, DRILLING and MILLING MACHINE . . .



Face milling massive section of Double-suction Pump.

Customer satisfaction is tested and here are the findings:

"Performance plus" is a user comment.

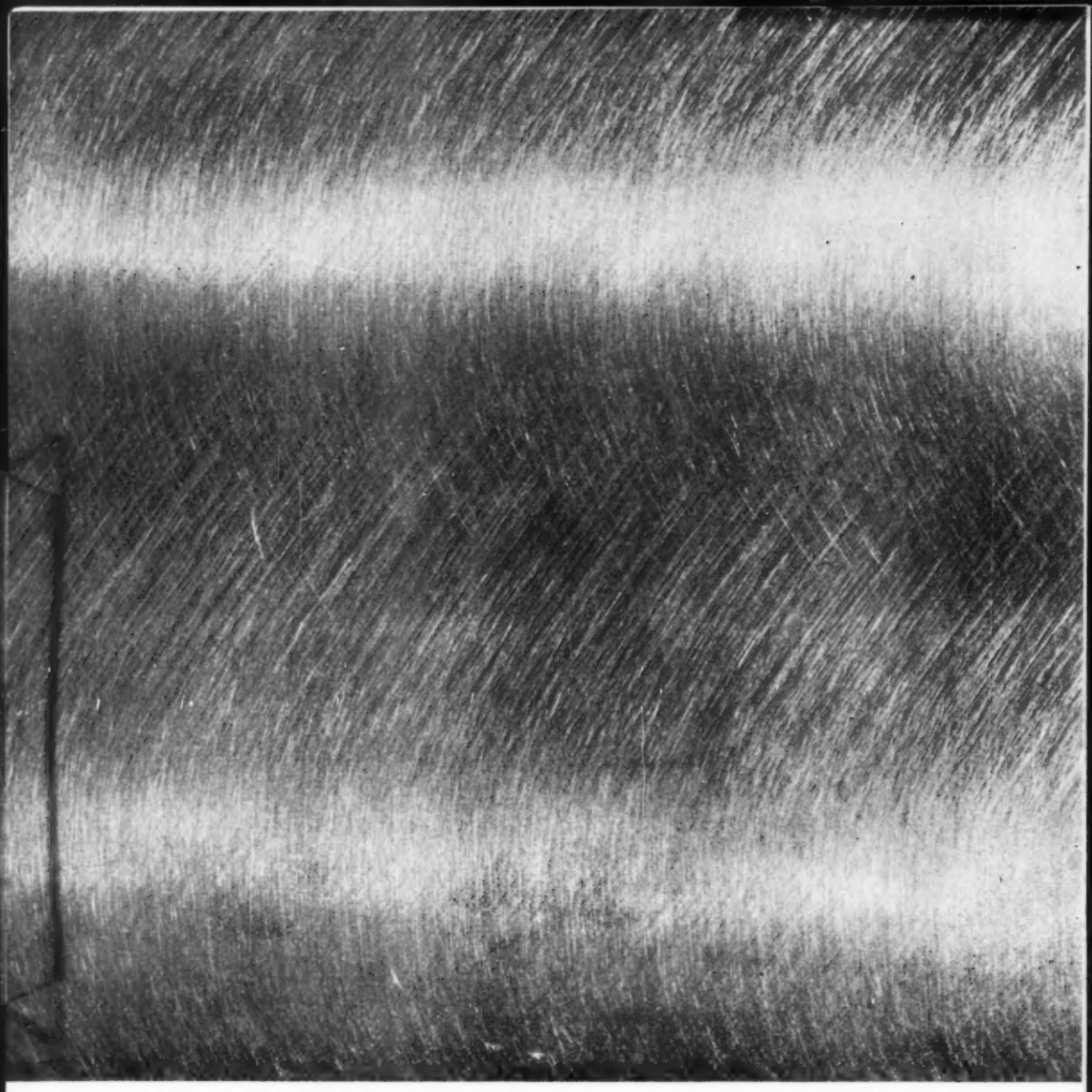
Another user states "We replace Universals with Universals."

Still another says "When we put a job on this tool, it comes off right. We had decided on another make but after seeing and studying Universal, we changed our minds."

One satisfied customer has used Universals since 1925. At present he has five in his plant, one recently purchased, two 10 years old, a fourth 16 years and the fifth with 18 to 20 years of service.

These comments, plus Bullard Proficiency in Engineering, are reasons why you should investigate and study Bullard-Universals for your shop. Write today for data on 3-4 and 5-inch spindle machines.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT



SUPERFINISH STARTS - OR STOPS - AT SCRATCH!

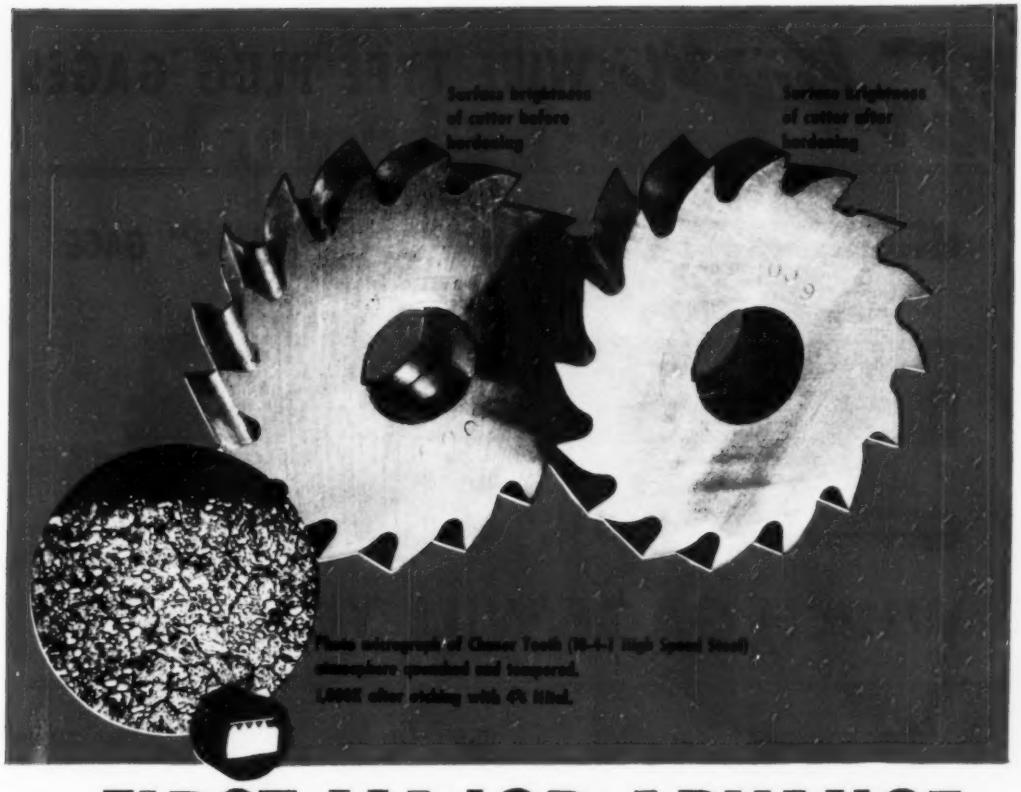
Perhaps you've thought of Superfinish only in terms of ultra-smooth surfaces. Not always! Here's one where the process has been stopped—controlled at a surface roughness of 10 micro inches. Note, in this magnification, how the abrasive grits have moved in paths which never duplicate, leaving a crosshatch pattern. For certain applications, such partially Superfinished surfaces have two distinct advantages: (1) removal of the soft "smear metal" left by grinding heat, (2) the crosshatch pattern maintains uniform distribution of lubricant to discourage spalling.

Superfinish has many other interesting applications. Write on your letterhead for the booklet, "Wear and Surface Finish."

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUNDTABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcome here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



FIRST MAJOR ADVANCE

IN HARDENING HIGH SPEED STEEL since the introduction of atmosphere!

Now . . . for the first time *all* the capabilities of atmosphere treating are fully realized. After three years of research, and more than a year of carefully guarded production testing in three installations in large industrial centers, this new process is available. It offers many advantages in production economies and increased tool life.

IT COMPLETELY ELIMINATES

. . . cracking of tools due to quenching strains
. . . removing scale by sandblasting or grinding
. . . drastic dimensional changes during processing
. . . washing quench oil from work
. . . carburization and decarburization troubles

SEND US A SAMPLE OF YOUR PRODUCT*

We will treat it and display it at the National Metal Show, Cleveland, October 17-21, where complete details of equipment used in this process will be demonstrated. See the Lindberg Display—Booth No. 1509.

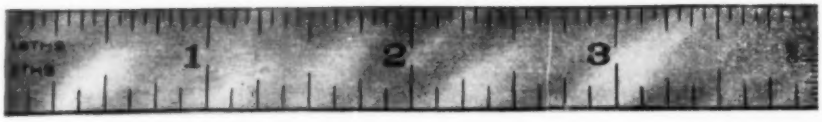
****Parts will be returned to you immediately after the show.***

LINDBERG ENGINEERING COMPANY 2445 W. Hubbard Street, Chicago 12, Illinois

LINDBERG FURNACES

Van Keuren WIRE TYPE PLUG GAGES

VAN KEUREN FULL 2" GAGE



AGD 1¼" GAGE

WHICH GAGE WILL YOU BUY?

CATALOG AND HANDBOOK No. 34

This 208 page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies are now free upon request.

Wire Type Plug Gages were originated by The Van Keuren Co. over 25 years ago. In 1948 this design was adopted in shorter lengths as the AGD standard for gaging holes from .030" to .510" diameter. The Van Keuren Co., because of years of pioneering, is able to offer the extra length at little or no extra cost.

You cannot afford to lose this extra length. When you need plug gages obtain a quotation from The Van Keuren Co.—Compare COST PER HOLE GAGED. You can be assured of quality and accuracy. A double inspection at the factory eliminates your inspection expense. No time will be lost waiting for replacements. You can count on prompt delivery from a stock of 2 million wires. Specify Van Keuren wire type gages and get the most GAGE for your GAGE DOLLAR.

Send for Supplement 19 showing quick and easy method of getting 4 to 10 gages from 1 VK wire type gage unit.

Available in

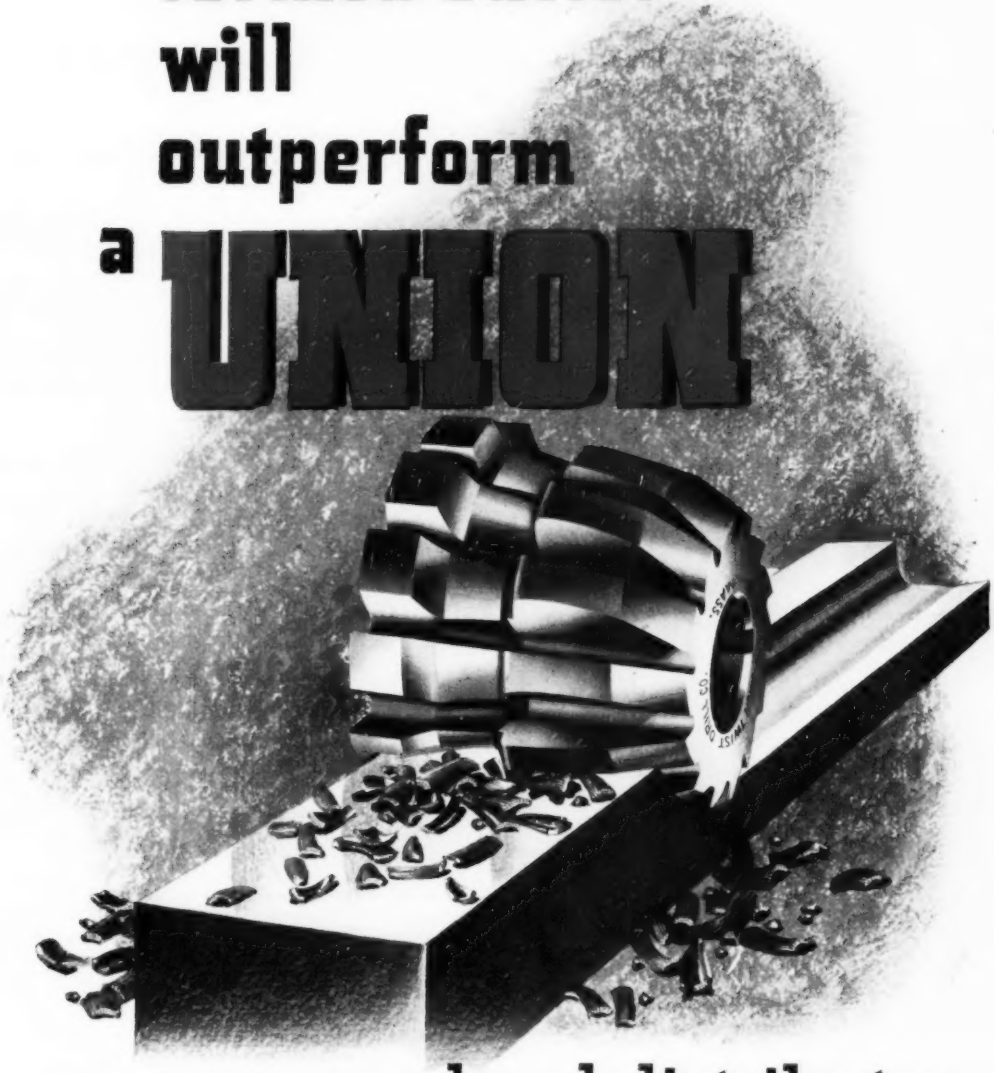
TOOL STEEL HIGH SPEED
CHROMIUM PLATE VK CARBOLOY
FOR SUPERSERVICE Phone Watertown 4-4394

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

30th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

no other formed cutter will outperform a UNION



contact your local distributor

His name is listed in Union's THOMAS' REGISTER insert under the heading "Drills, Twist".

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

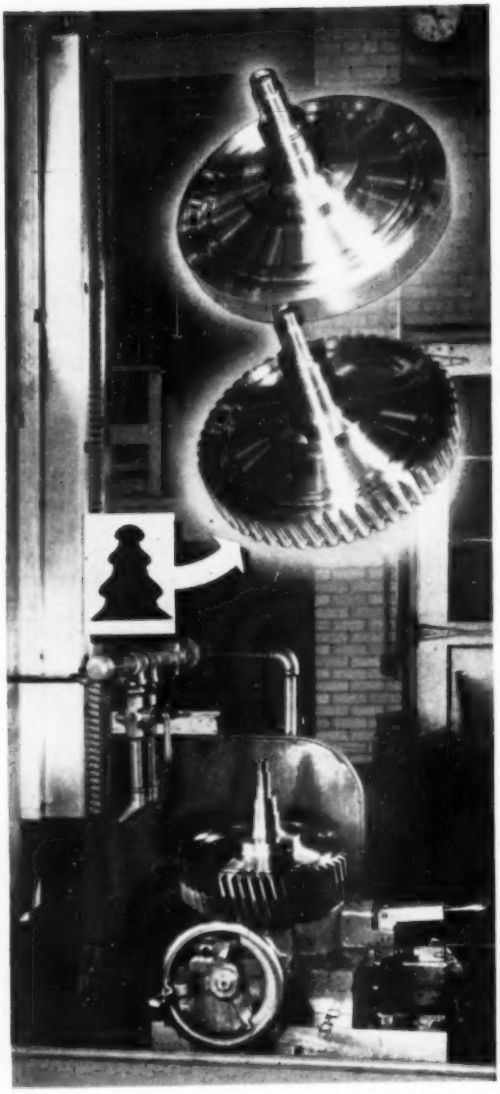
MILLING CUTTERS • GEAR CUTTERS • TWIST DRILLS • HOBS • REAMERS • CARBIDE TOOLS

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates.

BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers.

BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

Broaching the Xmas Tree Shape in Turbine Whee



THE ENGINEERED *American* WAY

Broaching an intricate Xmas Tree Shape to close tolerances is another problem solved efficiently and economically by American Engineers.

With a tough steel to machine (316 Stainless) and close tolerances to maintain, it was necessary to first rough and then finish broach the Xmas Tree Shape.

The rough and finish broaching operations were combined on a single ram American SB-54-10. This was accomplished by mounting rough and finish broach inserts on the machine slide and designing the fixture to traverse laterally from the rough position to the finishing position. The fixture was mounted on a hydraulically operated receding work table.

The operation sequence is as follows:

1. The part is secured on a manually indexed fixture.
2. The angular slots are rough broached around the entire periphery of the wheel at the first station.
3. The complete fixture is then traversed laterally to second station for broaching Xmas Tree form.

Fifty-three (53) Xmas Tree Shapes are broached ½" deep through 1⅜" length of cut on a 11¾" diameter wheel.

American Engineering is available for all turbine Broaching problems.

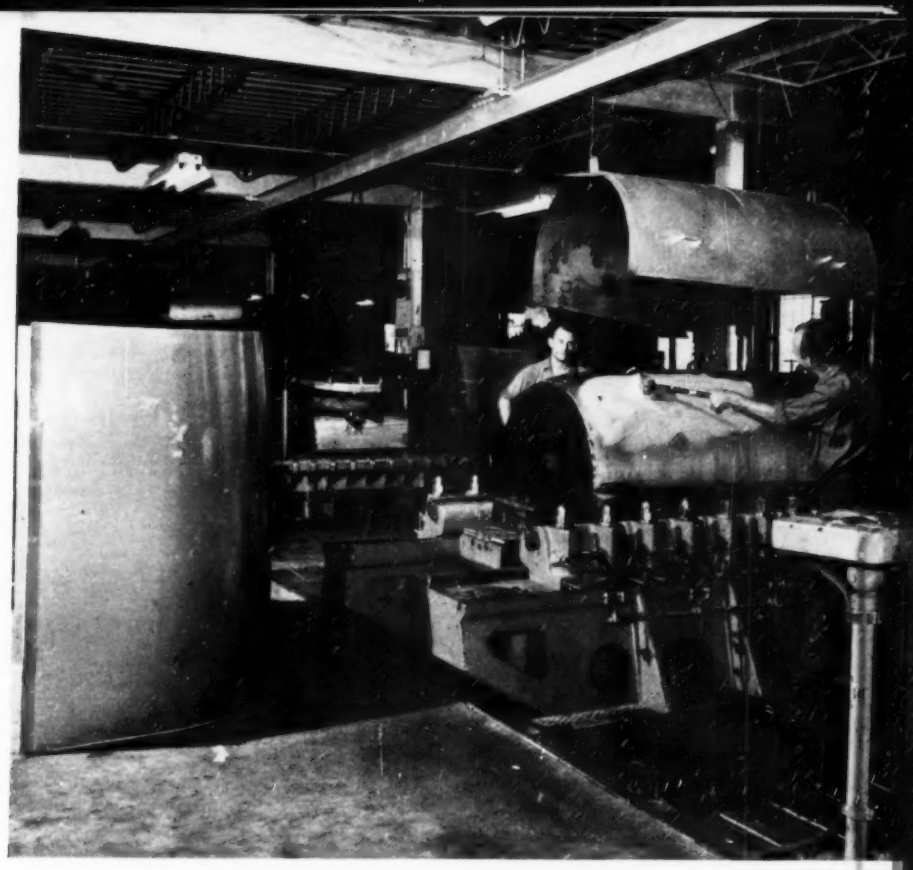
Engineered Broaching by American has proven time and again the way to economy and high production on a multitude of metal cutting operations. An engineered combination of American Broaching Machines, fixtures, and broaches is the efficient answer to production questions. Why not ask your question? Send a sample part, or blueprint, plus hourly requirements. We'll be glad to make recommendations. Request your copy of Circular Number 300. Address Department T.

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery



Better in the stretch . . .

SHOWN above is one of the stretch-forming press operations used by the Hart Pressed Steel Corporation, Elkhart, Indiana, to produce body parts for trucks and trailers. The parts are made from cold-rolled sheet steel, require draws of $3\frac{1}{2}$ to 4 inches.

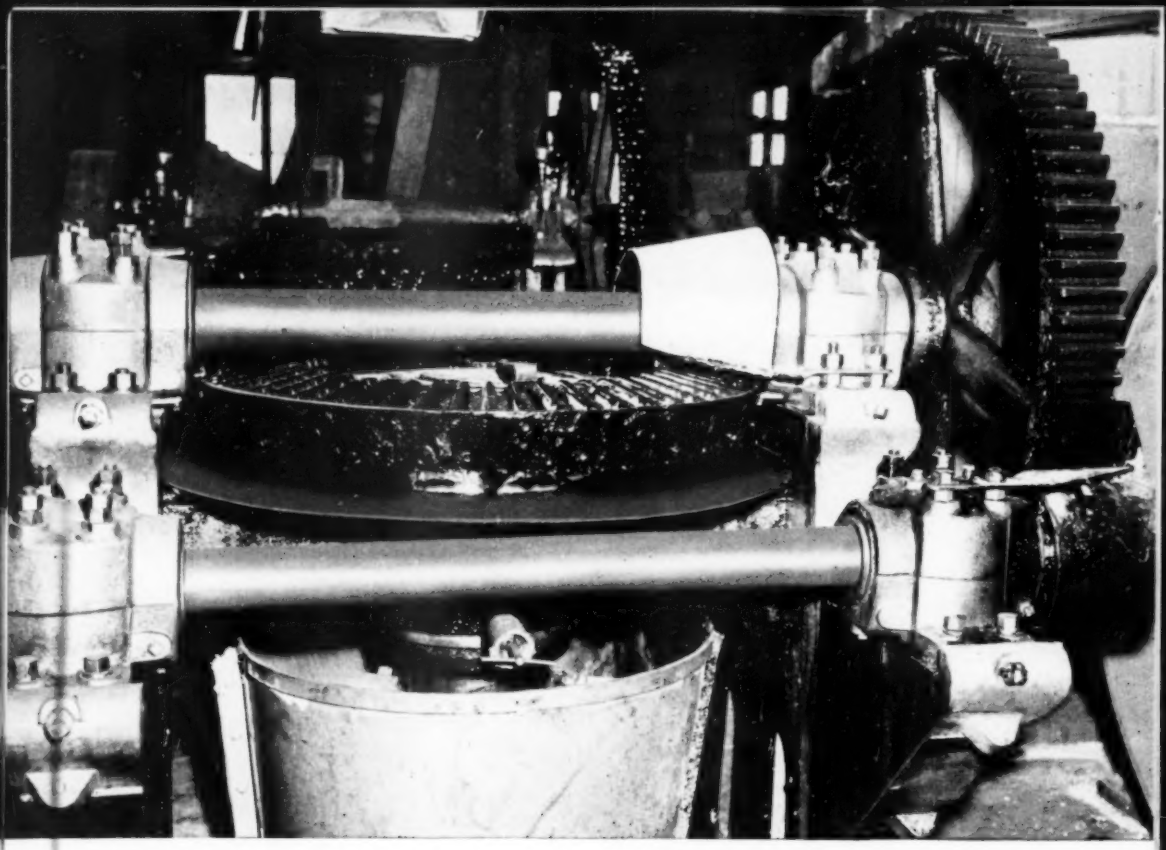
Of the many drawing compounds tried on these forming jobs, Stanostamp C Compound proved more economical to use and provided adequate protection for both dies and parts. Despite the variety and depths of the stretch draws made in this plant, there has been no part spoilage due to faulty die lubrication in five years' use of Stanostamp C.

On many different forming operations, Stanostamp Compounds have shown their ability to improve the quality of the parts produced, to increase the life of dies and punches, to provide easier application and removal of the drawing compound. They are economical to use because they can be blended with water or oil in various concentrations to handle a wide variety of forming operations. One of Standard's Cutting Oil Engineers will help you obtain the benefits of these superior compounds on your drawing and stamping jobs.

Stanostamp C Compound

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA) STANDARD



Cuts grease consumption by 1/3

● Lubricant drippage from the exposed gears on a pulp press caused trouble and expense for a midwest sugar-refining company. Renewal of the grease took time and labor, raised lubricant consumption.

At the suggestion of a Standard Oil Lubrication Engineer, a switch was made to a Calumet Viscous Lubricant. Despite severe conditions of heat and work, this grease did not thin out excessively. It adhered to the gears. Fewer applications were required. Lubricant consumption was cut by one-third.

Where open gears, as well as some enclosed types, are difficult to lubricate, try Calumet Viscous Lubricants. Their superior adhesive quality and greater wetting ability give them high resistance to the washing action of water and to thinning and throw-off at high temperatures. All grades of Calumet Viscous Lubricants can be applied without heating, and all but the heaviest grade can be applied by spraying. A Standard Oil Lubrication Engineer will help you choose the proper grades for your equipment.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

Calumet Viscous Lubricants

STANDARD OIL COMPANY (INDIANA) STANDARD

The Right Combination

YOUR BLANCHARD
BLANCHARD WHEELS
BLANCHARD SERVICE

Blanchard Wheels for Blanchard Grinders are designed and manufactured under the same supervision which for one-third of a century has produced Blanchard Surface Grinders.

Those years of experience are available to help Blanchard users get the utmost in Service from their Blanchards.

Call upon us for advice, sample grinding, or personal call by our Service Department, or our local well-known Distributor.

Call Our Dealer

ATLANTA, GA.
Noland Company

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BUFFALO, N. Y.
Rudel Machinery Company, Inc.
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CLEVELAND, OHIO
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BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

CUT HEAVY *and* LIGHT STOCK *Both*

NIAGARA

You don't have to adjust knife clearance on Niagara Power Squaring Shears every time you cut a different thickness of stock! Niagara capacity ratings are maximum capacity ratings, and they cut any thickness of stock up to their top rating WITHOUT TINKERING WITH THE KNIFE ADJUSTMENT.

And to prove it, look at the photograph at right...one man is cutting a 20 gage sheet and the other is cutting 5/8" plate BOTH AT THE SAME TIME, AND WITH THE SAME KNIFE ADJUSTMENT, AND WITH THE SAME GOOD RESULTS.

This is done daily in our own plant on our own work. We gladly demonstrate.

It speaks for Niagara design, Niagara rigidity, Niagara strength and the recognized ability of Niagara shears to deliver more working strokes per hour.

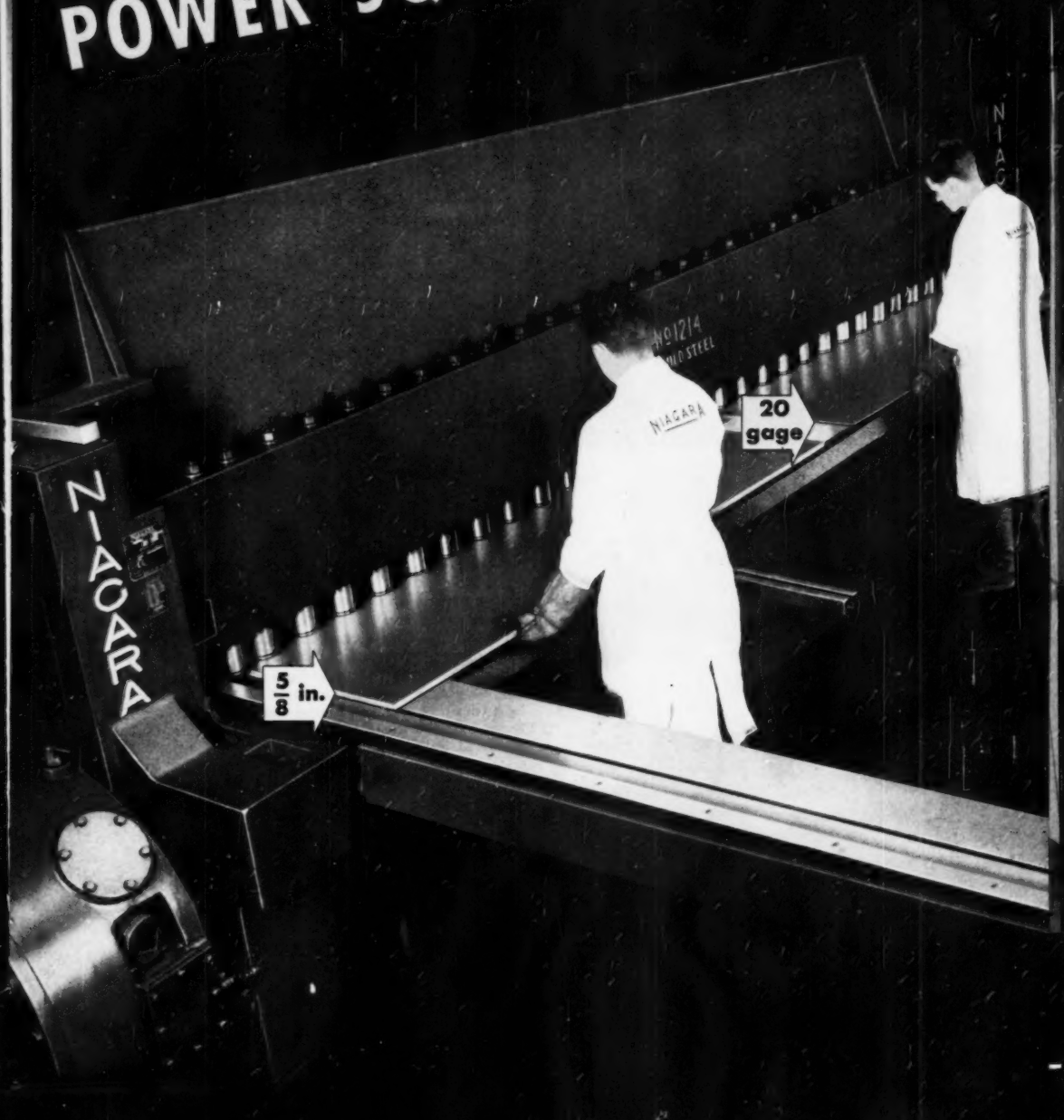
Write for bulletin.

NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, NEW YORK

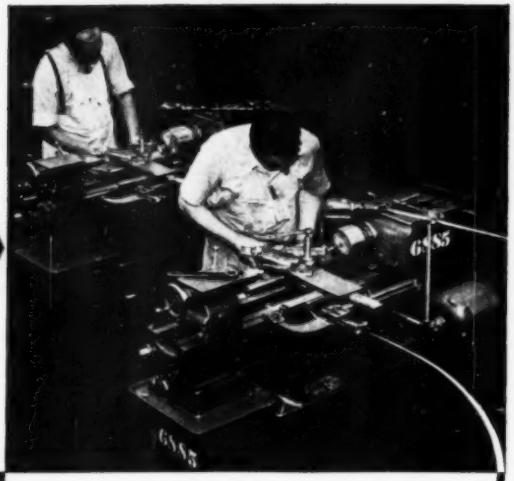
DISTRICT OFFICES: DETROIT, CLEVELAND, NEW YORK

at the Same Time on

POWER SQUARING SHEARS



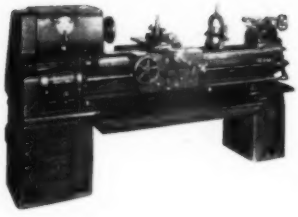
from Connecticut



Two 10" Tray-Top Cintilathes in use in the shop at Pratt & Whitney Aircraft, West Hartford, Conn.

Three Tray-Top Cintilathes in service at Wells Aircraft Parts Company, Los Angeles, Calif.

to California



Wells Aircraft bought its first Tray-Top a year ago and after six months ordered two more. Mr. Elmer Wells writes: "... Our work is of an experimental nature or short run jobs on aircraft which demand high grade finishes, close tolerances and trustworthy lathe alignments ... We believe the **Ground Ways** are an important factor in producing accurate work ... Our operators find the 1200 rpm and twelve speeds to be a decided advantage, particularly in changing from steel to aluminum parts of varying sizes and diameters ... The enclosed **Quick Change Gear Box** is a good feature, it eliminates chips from clogging the gears."

Before you buy your next light duty engine lathe, examine the sound practical features of Tray-Top Cintilathes. Add them up and you'll find the "Twenty-Feature" Tray-Top Cintilathe gives you the most utility for the least investment. Swing sizes: 10", 12½", 15", and 18". 15" and 18" sizes available with gap and gap block. Write for Bulletin T-100-2. Cincinnati Lathe & Tool Co., Cincinnati 9, Ohio.

cintilathe

TWENTY-FEATURE TRAY-TOP

THE GREENFIELD STORY

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You have a neighbor who has a complete stock of "Greenfield" threading tools, waiting for your call.

He's a good neighbor. He knows his business. He's friendly and anxious to serve you. He may be able to help you with a threading problem and save you a lot of money.

This neighbor of yours is the "Greenfield" Distributor. There are over 1,000 of them, located in every industrial neighborhood in this country. Working closely with him, and at your service also, is a trained "Greenfield" threading tool engineer. They make a team of good neighbors that have been serving American industry, in war and in peace, for over 75 years.

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Divisions of Greenfield Tap and Die Corporation

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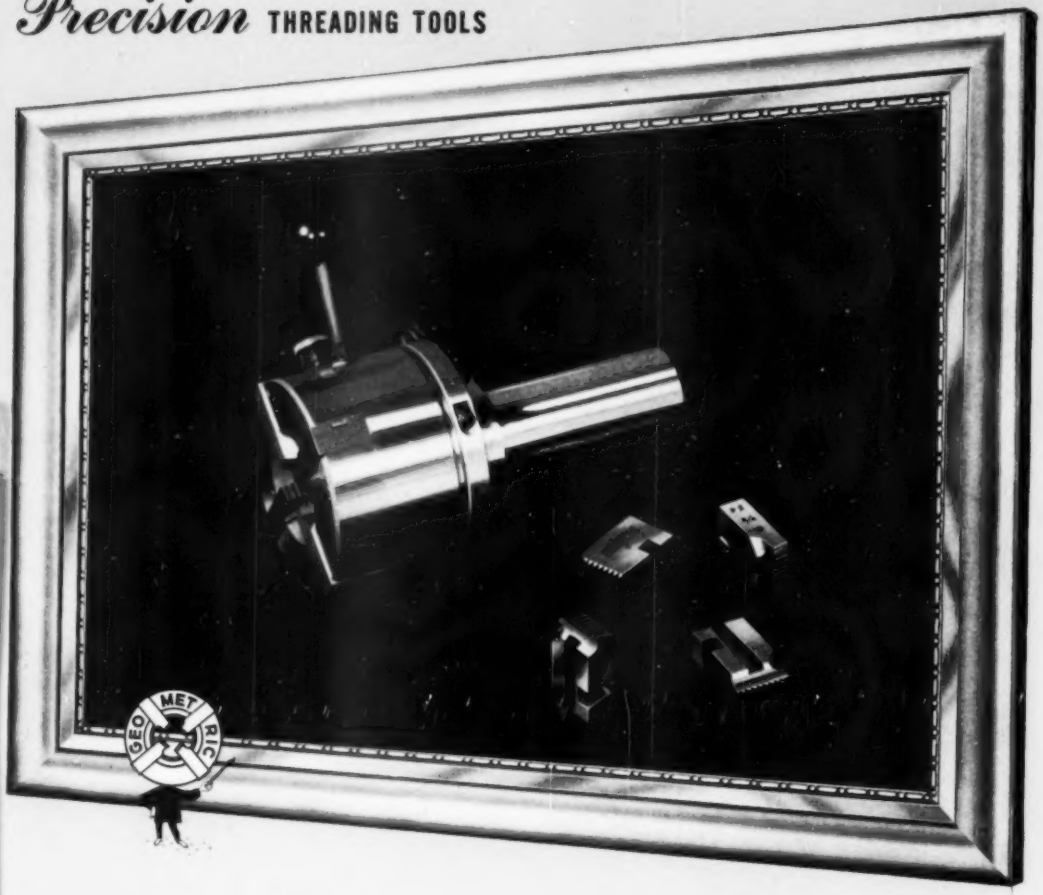
GREENFIELD

Be Sure
Buy "Greenfield"

Precision **THREADING TOOLS**



Self Opening Style D Die Head and Chasers

A heavy duty die head of the stationary type which will cut National Coarse, National Fine and National Pipe Threads. Can be used for finer pitches.

* *

Available in seven sizes with a cutting range of ⅛" to 2½" diameter.

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GEOMETRIC also makes a complete line of Rotary and Stationary Self Opening . . . and Solid Adjustable Die Heads—Collapsing . . . and Solid Adjustable Taps—and GEOMETRIC Chasers.

"Be Sure . . . Buy Geometric"

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TOOL COMPANY, NEW HAVEN 15, CONNECTICUT

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GTD AMPCO

How to make your machines Sing ...for a Song

SWITCH TO CIMCOOL°, and listen to your machines humming in smooth, fast harmony. Then watch for an important scaling down of metal cutting costs. For this revolutionary cutting fluid—this *chemical emulsion*—saves you money three important ways:

- CIMCOOL INCREASES TOOL LIFE (and thus reduces down time) because of its *chemical lubricity*.
- FASTER SPEEDS are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.
- CIMCOOL COSTS LESS than old-fashioned cutting fluids because it lasts longer. It also cuts cost of cleaning and changing. It virtually eliminates rancidity and foul odors. And because of its low surface tension and low adhesion to work and chips, there is practically no carry off.

Write for free booklet, "CIMCOOL Gives the Answers." Address, Sales Manager, CIMCOOL Division, The Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

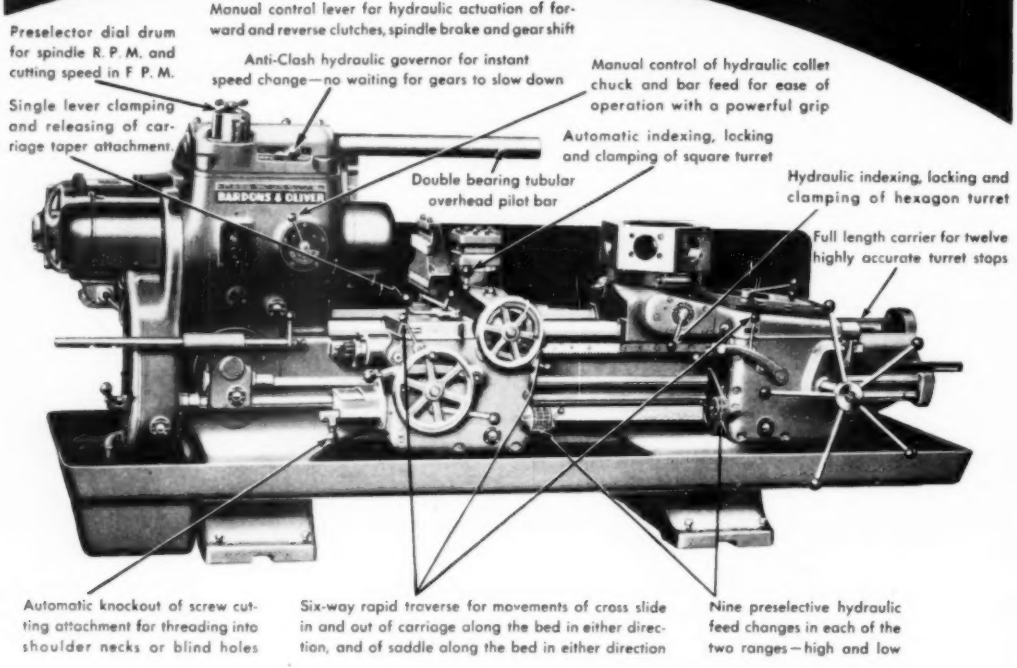
°Trade Mark Reg. U. S. Pat. Off.

A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85%
OF ALL METAL CUTTING JOBS

PAYS LARGE DIVIDENDS THROUGH *Increased Production!*

The BARDONS & OLIVER No. 22 SADDLE TYPE TURRET LATHE is an Outstanding Investment for *Low Cost Production* of *High Quality Work*


Manual control lever for hydraulic actuation of forward and reverse clutches, spindle brake and gear shift
Preselector dial drum for spindle R. P. M. and cutting speed in F. P. M.
Anti-Clash hydraulic governor for instant speed change—no waiting for gears to slow down
Manual control of hydraulic collet chuck and bar feed for ease of operation with a powerful grip
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Full length carrier for twelve highly accurate turret stops
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Automatic knockout of screw cutting attachment for threading into shoulder necks or blind holes
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Note the combination of features listed above. This is exclusively Bardons & Oliver design, to be found in no other line of machine tools. Check the features against your needs for more efficient, lower cost production. Investigate the possibilities. Write us for full information.

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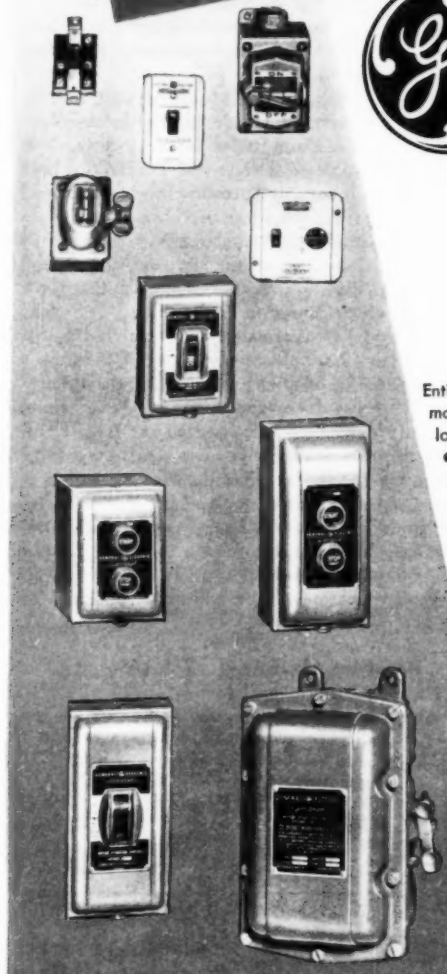
more for your money



NEW manual motor starters

- new, improved features
- wider selection

Entire line of G-E manual starters—for fractional up to 7½ horsepower motors—now offers new design features that mean easier installation, longer operation at no increase in price. Here they are:

- A complete new line of pushbutton starters for controlling integral motors. Both pushbutton- and toggle-operated starters are available in the new four-pole form as well as the two- and three-pole forms previously offered.
- Bi-metallic overload protection—formerly found only in expensive equipment—provides quick, positive action, frequent resetting without wear. When relay trips, operating mechanism assumes neutral position, giving positive indication of overload trip.

All starters provide . . .

- heavy duty switch mechanism that resists vibration, stands up under frequent use . . . plenty of knockouts, lots of room in the sturdy grey case for wiring . . . dust tight, water tight, and explosion-proof as well as general purpose forms . . . and many other features described in the bulletins.

Whatever your requirements for small-motor starting, you'll find them met in G-E manual starters. Write now—buy now!

General Electric Company
Apparatus Dept., Section E730-8
Schenectady 5, N. Y.

Please send me: Bulletin GEA-2234E on the CR1061 Manual Starter for F-hp motors.....and (or) Bulletin GEA-1522E on the CR-1062 Manual Starter for Integral Motors.

Name .....

Company .....

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SHOULDER GUIDE PINS
SPRING ANCHORS
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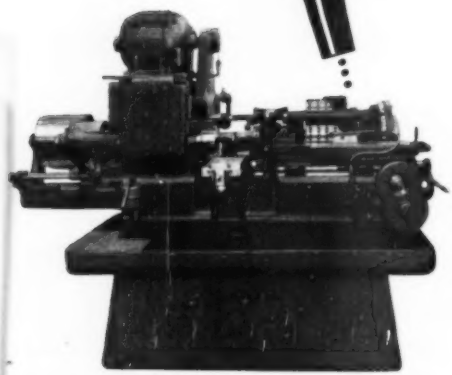
FUNNEL your production of parts like these . . . THROUGH CLEVELAND MODEL B SINGLE SPINDLE AUTOMATICS



Cleveland Model B Automatics are among the most versatile and practical of all machine tools. They give fast production on an extremely wide range of automatic turning and forming where multiple diameters, shoulders and tapers are involved.

Simple tooling is mounted on a long, flat milling slide capable of turning several diameters in one operation and on two independent cross slides where forming and turning may be completed in time with the milling slide operation. One end-working operation can be performed from the milling slide, when required. An independent cut-off attachment and swinging gauge stop are provided to free the cross slides and milling slide for other operations and a cross slide turning attachment is available for turning work which cannot be formed.

Cleveland Model B Automatics are readily adaptable to a wide variety of second operation work by using a hopper magazine for feeding parts through the spindle. When not in service, the magazine is swung to a neutral position and the machine converted to bar feed. Chute and rotary tilting-type magazines can also be used, depending on the size and shape of the part.

If you are manufacturing parts like those listed above—and that list is by no means complete—investigate the dollar savings you can make by producing those parts on Cleveland Model B Automatics. Ask Camco engineers to submit a direct proposal with production estimates on your work.

Remember, *Clevelands Cut Costs*

Cleveland Model B Automatics are made in four sizes ranging from 1-1/16″ to 5¼″. For long shaft work, the Cleveland 2½″ Model B Shaft machine performs turning and forming operations on pieces up to 18″ in length. (Also available on special order for 24″ lengths.) For double end work, 1″ and 2″ Cleveland Model J Automatics are available for double end turning, threading, pointing and chamfering.

8-page illustrated Bulletin "B" gives complete descriptions and specifications on all these Cleveland Automatics. Write for your copy today.

The Cleveland Automatic Machine Co. manufactures and stocks a complete line of STANDARD TOOLING and COLLETS for use with Cleveland Automatics. Prompt deliveries. Write for complete information.

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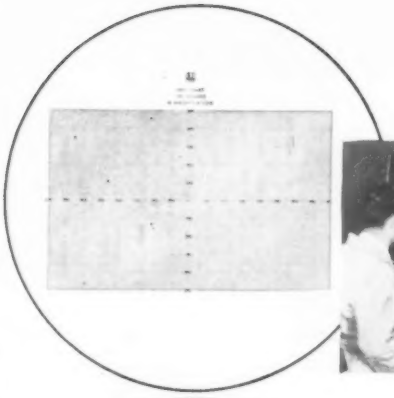

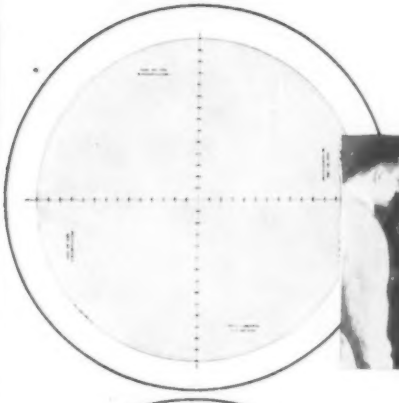

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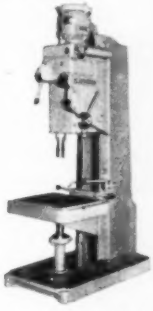
That is why present users send repeat orders . . . they know from their own experience exactly what Cleereman Drilling Machines will do. Prospective users want Cleereman after they have checked performance and maintenance records.

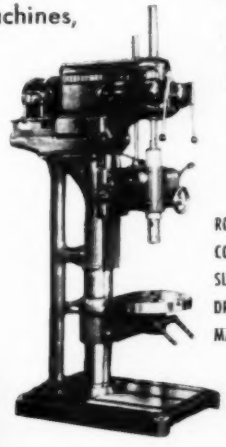
If you do not now use Cleereman Drilling Machines, let us refer you to an installation for your personal inspection.

Write for Catalogs.



#325 SINGLE UNIT SLIDING HEAD DRILLING MACHINE

BOX COLUMN SLIDING HEAD DRILLING MACHINE



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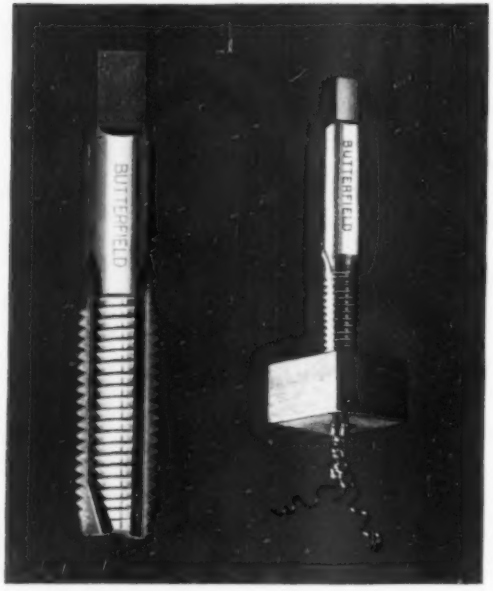
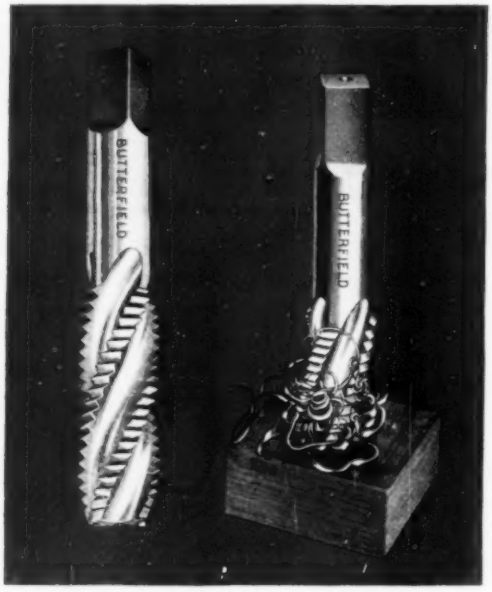
BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

Let the chips fall either way!



CHIPS CURL DOWN and out of deep through holes when you use Butterfield Ground Thread Spiral Pointed Taps — right hand cut, left hand spiral points. No chip clogging in the flutes. These taps also recommended for blind holes when drilled deeply enough to allow clearance for chips at bottom of hole.



CHIPS SPIRAL UP and out of blind holes that have little or no chip room at the bottom when you use Butterfield Ground Thread Spiral Fluted Taps — right hand cut, right hand spiral flutes. Flutes are milled to the correct degree of spiral allowing tap to cut freely while ejecting chips from hole.

INSIST ON BUTTERFIELD GROUND THREAD TAPS

Whether you want to tap blind holes or through holes, there's a Butterfield Tap to meet your need . . . to cut smooth, accurate threads in aluminum, magnesium, brass, copper, zinc and similar materials. What's more, because they're *Butterfield*, you get extra assurance of top performance, maximum savings in time and money. *Every Butterfield Tap is individually inspected.* These taps, too, are *ground thread*... providing maximum accuracy and savings by fewer wasted threaded parts.

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THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES

1874

215 square feet

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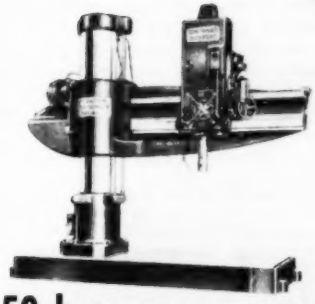
UPRIGHT DRILL

In our Seventy-Fifth year

. . . of manufacturing metal drilling machinery, we extend our thanks and appreciation to industry throughout the world, for the confidence placed in us. This confidence has contributed to our continuous growth, and has made it possible for us to become the largest company in the world devoted exclusively to the manufacture of radial, upright and jig boring machinery.

1949

270,000 square feet



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RADIAL DRILLING MACHINE

Our 75TH Year
CINCINNATI BICKFORD
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METAL DRILLING MACHINERY
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"No, no, Bascom! Just a screwdriver!
This machine is Reeves-equipped!"

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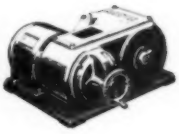
VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16x1. Sizes—fractional to 87 hp.

VARI-SPEED MOTOR PULLEY provides an instantly variable speed drive within 4:1 ratio for any constant speed motor. Sizes to 15 hp.

MOTODRIVE combines motor, speed varying mechanism and reduction gears in single unit. Speed variations 2:1 to 6:1 inclusive. Sizes to 20 hp.



Maintenance of machines equipped with REEVES Speed Control requires no special tools—no special training. REEVES units incorporate an operating principle proved in more than 260,000 installations. Simplicity of design and rugged construction throughout, with all working parts easily accessible, assure low-cost, trouble-free service. And on the job, REEVES Variable Speed Drives give you smooth, instant speed changes—provide *exactly* the right speed for every job under every changing condition. Result: increased production . . . improved, uniform quality . . . lower production costs. Install REEVES Speed Control on machines now in service—specify "REEVES-equipped" whenever you buy new machines.

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Recognized Leader in the Specialized Field of Speed Control Engineering

ACCURATE • VARIABLE
Reeves Speed Control
GIVES THE RIGHT SPEED FOR EVERY JOB!

SPOT NEWS OF METALWORKING

A new development in automatic gaging has been produced by Sheffield Corp. for automatically checking all critical dimensions of an automotive valve tappet and properly segregating the acceptable, rejected and salvageable parts. One worker operates the machine which has a cycle capacity of 2000 parts per hr. The human element of error is entirely eliminated in the measuring of each dimension and in proper segregating of parts. It was designed and built for one of the world's largest automobile makers.

Evaporation of metals under high vacuum opens up a whole new field for production of gold leaf and other foils. Process can be used for plating any metal onto any metallic or non-metallic surface. One immediate use is applying metal coating to paper for production of electrical condensers. (See article, p. 118.)

All new engines for GM cars will be of the overhead valve type. Only Pontiac and Olds "6" still have L-head engines. Dodge is also trying out a new overhead-valve six for 1951 models. Studebaker and Chrysler are both said to be playing with V-8 engines of the overhead type. New Cadillac and Olds V-8's have been so successful this year that there is a definite trend that way for '51 or '52. Even Packard has a V-8 developed.

System for cleaning iron and steel through use of ultrasonics has been developed by Massa Laboratories, Cleveland. Massa is cleaning steel in a matter of seconds, using present cleaning fluids at room temperature and "shot" with 300,000 cycles or sound waves. The system also descales.

Detroit rumor: "Bouncing putty" to replace valve tappet springs.

Gas turbine engine for passenger cars has been under development in England. The unit is only 4 in. in diameter and develops 100 hp. The turbine itself has proved successful, but practical application has been stopped by builder's inability to obtain bearings which will stand up for more than a few hours.

Export-Import Bank loan of $100 million probably will be made to Yugoslavia in early October. Broken down into five yearly payments of $20 million each, money will be used to buy metal mining machinery and forest industry equipment in the U.S. Tito plans to pay the money back out of production of such things as lead, zinc, manganese.

A new rear-axle-housing automatic machine has been ordered by Cadillac from Foote-Burt in Cleveland. Quotation was understood to be over 20% lower than was submitted by others.

Government will get 24 million lb. of aluminum ingot for stockpiling from Permanente as a 5% down payment on three aluminum plants bought for $36 million. Reynolds is also negotiating for aluminum ingot delivery in lieu of certain cash rentals and payments on five aluminum plants leased and one such plant purchased from the government.

Borg-Warner overdrives will be offered by Nash as extra equipment on all 1950 cars. An optional automatic transmission—probably "hydromatic"—will be offered also on Nash's higher priced Ambassador. B-W is also said to have developed an automatic transmission for Ford that may be available soon as Chevrolet's torque converter. The Warner design does not have a torque converter. New sprayed or dipped graphite coatings, 0.00015 to 0.0005 in. thick, increase wear-surface life 3 to 10 times under high bearing and pounding loads. Developer claims process avoids galling of bearings or bushings at lowest cost.

Gaging Metalworking

Business in metalworking lines is rising well above its June low, according to reports from the industry.

The AMERICAN MACHINIST Index of Production suggests a rise in July. The index, on preliminary findings, stands at 200—but it does not fully reflect the effects of plant shutdowns for vacations. If allowance is made for vacations, July might be several points above the June figure of 202.

The Federal Reserve Board's Index of Production—estimated at 162 for July (1935-39 = 100)—likewise does not allow for vacations. Adjusted for holiday shutdowns, it would probably match June's figure of 169. August, however, will probably see a sharp rise.

New Monthly Auto Record

The automobile industry is hitting a record pace—producing probably more than 640,000 cars and trucks in the month. That tops the 1929 peak of 621,000 cars turned out in April, when dealers were stocking up for the summer rush.

That fall will see the industry again in sharp competition is clear from all signs. In New York a dealer advertises a $500 turn-in allowance for any used truck that "will run, creep, or crawl." New car stocks in the hands of dealers in JUNE, 1948 were estimated at under 300,000—and they are now thought to be over 500,000.

▶ But the industry expects to build 5.6 million cars and trucks this year—another new record. Optimism comes from three points: Used car sales, dragging earlier in the year, have been running strong. Dealers report their stock of used cars are generally low and business is better than they expected. Secondly, new car sales are booming. General Motors, for example, reports that business is good and there is nothing in sight to change the outlook in the next few months. Finally, new models are perking buyer's interest. Buick is stepping up production of its new Special from 800 to 1200 a day to meet an avalanche of orders.

Upturn in Steel Output

Steel production—running at less then 70% of capacity in early July, is now touching 85%. The industry believes the upturn is sparked both by customers who are buying to meet normal demand after drawing down their inventories and by customers stockpiling against the possibility of a strike. Aside from the effect of that stockpiling, however, the prospects are that steel will go through the fall at a high level of operations. With metalworking generally at a high level, and construction booming, steel demand is strong.

Fasteners at High Level

The fastener industry — whose health is a key indicator of metalworking activity—is at a high level. The industry's dollar volume in the first six months was only 16% below the first half of 1948. During that period, too, customers were working off unbalanced inventories.

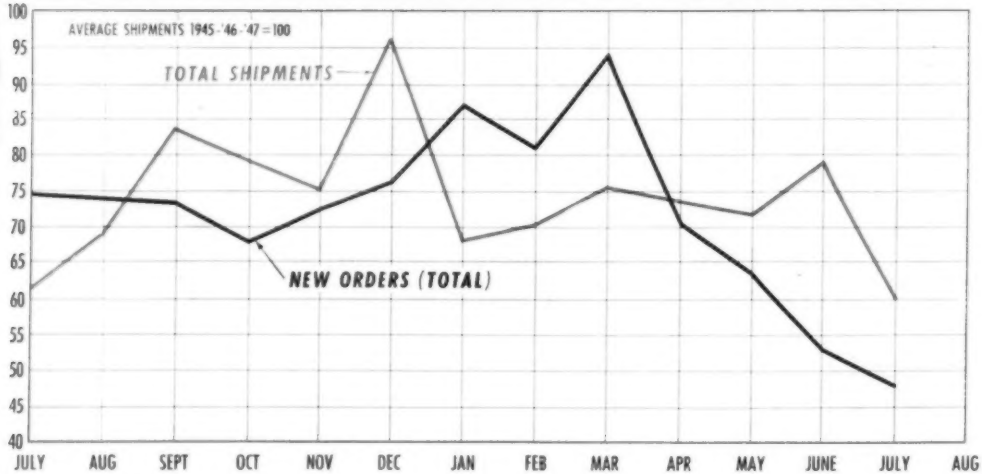
Homebuilding Helps Appliances

Appliances — spurred by easier credit terms and the boom in homebuilding—are recovering from their spring let-down. Even vacuum cleaners, reportedly one of the first major appliances to fill the backlog of wartime demand, are going at a rate almost double the prewar record. By early August, the industry had shipped more standard-sized units than it did in all of 1941—its best prewar year.

No Easing of Non-Ferrous Prices

Prices of non-ferrous metals are firm—and industry observers believe there is no easing in sight. Copper, lead, and zinc prices climbed when orders recovered from their early summer slump. In addition,

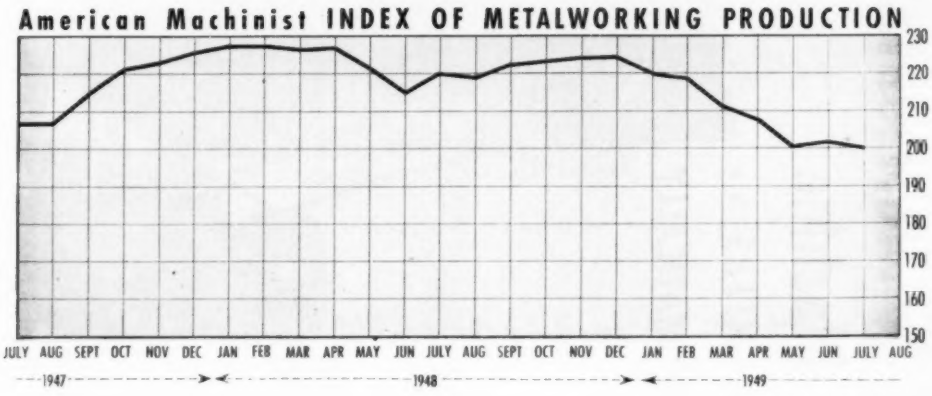
TOOL ORDERS CONTINUE DOWNWARD, BUT AT SLOWER PACE



	JAN	FEB	MAR	APR	MAY	JUNE	JULY
New Orders (Total)	87.0	80.9	93.5	70.1	63.7	53.6	p48.0
Foreign Orders (Included in Total)	21.9	26.5	22.3	23.1	15.9	15.7	p14.2
Shipments (Total)	68.8	70.3	75.8	74.9	72.8	79.0	p60.8

Source: NMTBA

(p—preliminary)



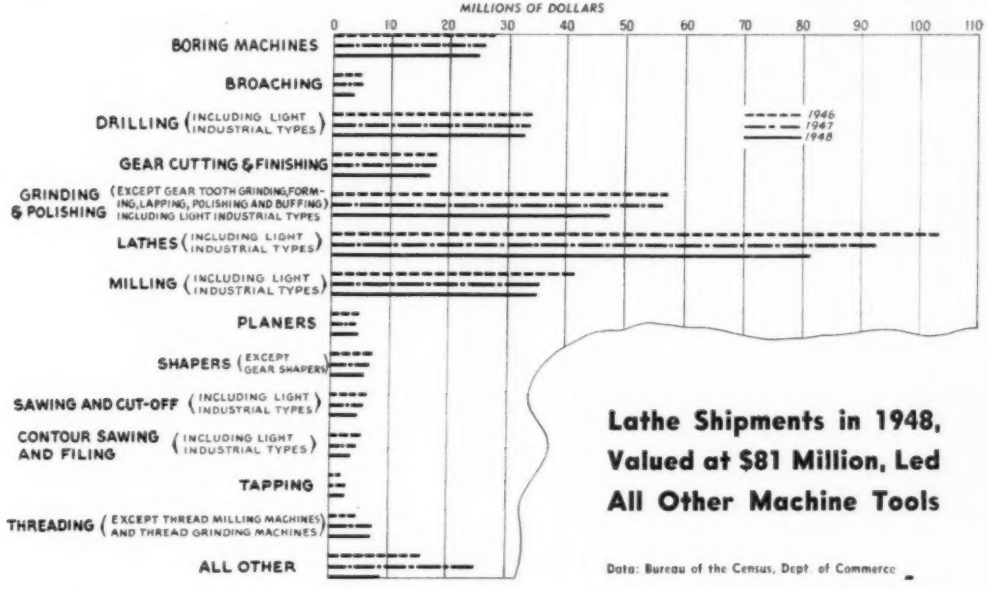
INDEX	COMPONENTS				
	MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANS-PORTATION EQUIP.	OTHER METAL-WORKING
July 1949 (preliminary) 200	198	191	234	279	135
June 1949 (revised) 202	203	194	238	281	137
July 1948 220	250	226	229	305	147

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1. Index figures are a percentage of 1939, which equals 100.

strike threats, and current strikes in one copper refinery and a major lead mine, cloud the market. In the longer run, decisions on the stockpiling program, whether or not the copper tariff will come back, and decontrol of tin use, will have a major bearing. The industry expects controls on use of tin—but perhaps not on prices—will go. United States foreign policy bears on both tin and copper prices. The metals are important dollar earners for South American countries and the British Commonwealth.

Pick-Up in Gray Iron

The gray iron foundry industry, operating recently at about 50% of its 1947-48 peak, sees enough orders coming in to raise production to about 60% of the peak rate. The pick-up is most marked in the Pacific and Atlantic Coast areas—which have been harder hit then mid-west foundries. Most optimistic are the companies with licenses for production of nodular iron castings.



Lathe Shipments in 1948, Valued at $81 Million, Led All Other Machine Tools

Data: Bureau of the Census, Dept. of Commerce

This MORRIS Horizontal Four Way *Hydraulic* Machine

... DRILLS ... BORES ... CHAMFERS ...

AUTOMOBILE CYLINDER BLOCKS AUTOMATICALLY

● In line with the growing trend toward equipment developed for specific job requirements, Morris has produced this automatic hydraulically controlled machine for drilling, boring and chamfering automotive cylinder blocks.

This machine has both left and right hand side heads plus a rear head and one angular head. Each side head contains one spindle, the rear head has five spindles and the angular head one spindle.

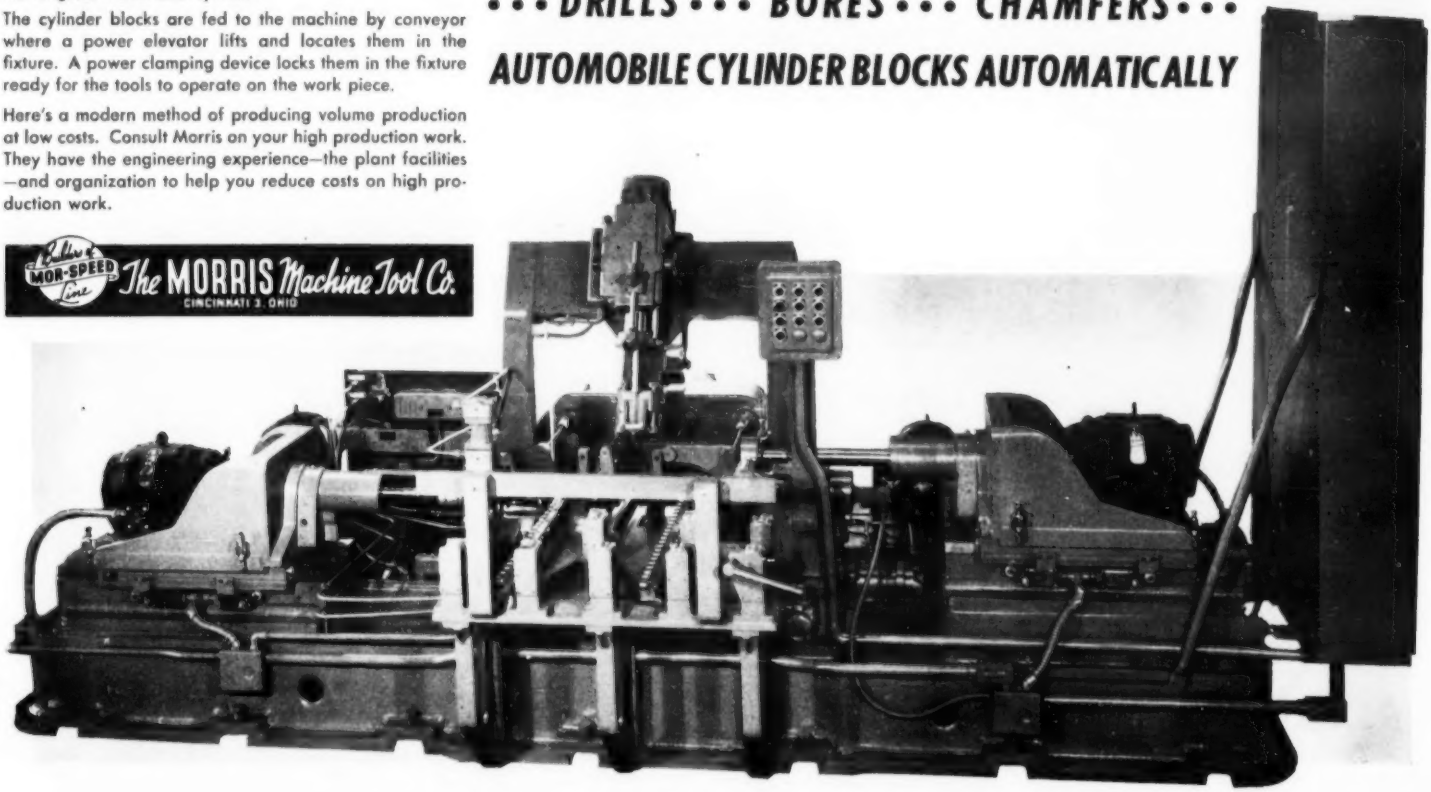
The cylinder blocks are fed to the machine by conveyor where a power elevator lifts and locates them in the fixture. A power clamping device locks them in the fixture ready for the tools to operate on the work piece.

Here's a modern method of producing volume production at low costs. Consult Morris on your high production work. They have the engineering experience—the plant facilities—and organization to help you reduce costs on high production work.

Builders of MOR-SPEED Line

The MORRIS Machine Tool Co.

CINCINNATI 2, OHIO



American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Our Most Backward Area

The belief that American industry is "the last word" in efficient mechanization is a popular fallacy.

This pleasant theory has been disproved time and again. From preliminary figures at hand, we know that it will be disproved once more when the American Machinist Mid-Century Inventory of Metalworking Equipment is published next November 3.

It is a disturbing fact that industry suffers from obsolete and inefficient mechanization. The cause is not bad policy in selection of new equipment for a new or expanded plant. Rather it is bad policy in the timing of replacements in existing plants.

This conclusion is arrived at by George Terborgh, research director of the Machinery & Allied Products Institute, in his new book, "Dynamic Equipment Policy," just published.

Mr. Terborgh states that "obsolete mechanization is first and foremost the result of a degenerative process which develops with the aging of the industry or of the establishment affected. It is a disease of maturity."

The sole remedy is a sound replacement policy. Such a policy doesn't just happen. There are three prerequisites for it: (1) a reasonable test of replaceability, (2) a proper organization in charge, and (3) a proper attitude all along the line in management, including top officials and the board of directors who make the final decisions.

As for the "stodgy and unprogressive attitude toward replacement" by many management men, the only cure is enlightenment. Mr. Terborgh insists that management "simply does not know what good policy is and is shooting in the dark."

"Dynamic Equipment Policy" is no substitute for a good murder story as summer-hammock reading. It does get down to the essentials, however, of discussing the basic principles of sound reequipment analysis, with practical procedures for applying them.

Our own inquiries from time to time have revealed the haphazard, mostly rule-of-thumb manner in which most metalworking companies, both large and small, go about choosing new machinery to replace old.

One wonders what would happen to their sales if they were as casual about them as about equipment replacements.

Mr. Terborgh puts his microscope on the most backward area of industrial management today. He calmly and logically states the case for what should be done to turn that area into one of enlightenment.

We urge every alert metalworking executive—the directors and other financial men too—to read and study Mr. Terborgh's book.

Burnham Finney

EDITOR

NEW CATALOG

Here is the latest information on low cost machining. This 32-page, heavily illustrated catalog contains complete specifications and features of Cincinnati Shapers. Many practical and useful shop applications are illustrated. Cincinnati Shapers give you maximum versatility with minimum investment and minimum tooling cost. Write for your copy.

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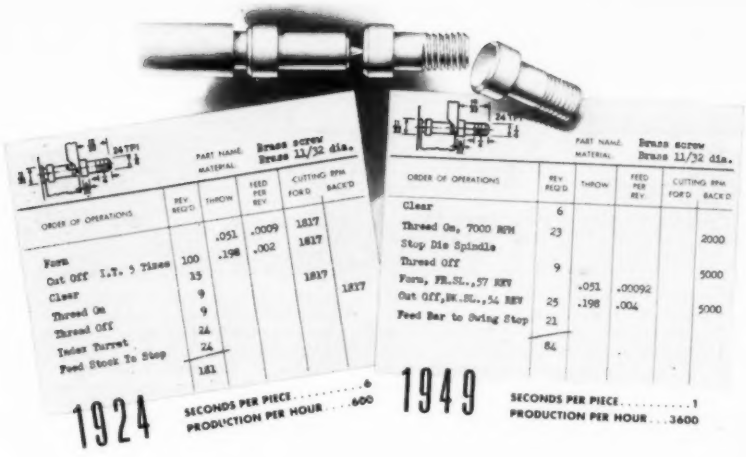


DO MACHINE TOOLS COST TOO MUCH?

A look back to the "good old days" of 1890, and comparison with various periods between, shows that new equipment is still the world's best investment

BY E. J. TANGERMAN
Managing Editor

"NEW MACHINE TOOLS cost too much." That remark, in one form or another, is frequent. But everything costs too much, according to the man in the street. Take the automobile as an example. Everyone knows a car costs roughly twice what it did. But General Motors proved in Washington that the 1949 Chevrolet was better than the 1927 Buick in every respect—and $100 cheaper.

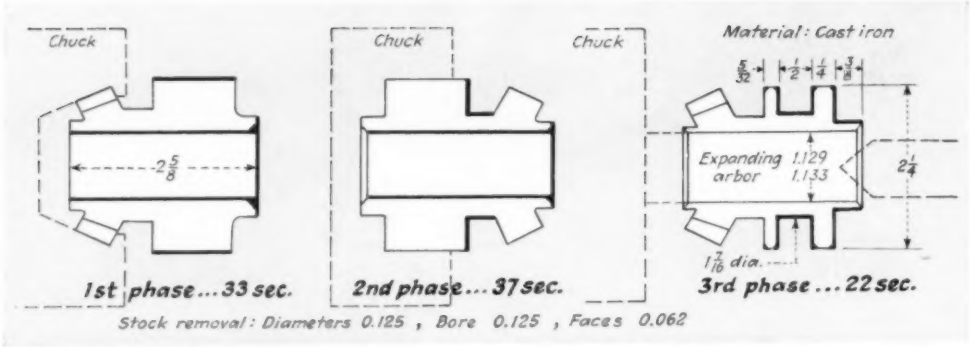
Again, George Christopher, president of Packard, said recently that Packard prices are down 53% ($4 650 in 1924; $2,249 today) in the last 25 years, while prices of basic materials have increased thuswise: steel 53%, copper 78%, brass 93%, coal 109%, iron 127%, lead 133%, zinc 169% and coke 311%. Only decreases are rubber 27%, and aluminum 46%. And here's the salient point: A Packard worker had to work 6,577 hr at 71 cents per hr to get the old car, but needs to work only 1,363 hr at $1.65 today for the 1949 car.

In general commodities, values are unchanged, but prices are tremendously increased. This leads to a fallacy in popular thinking about prices, and the failure to balance them against income and relative performance. **The like fallacy in evaluating machine-tool prices is the failure to balance cost of new equipment against potential savings.**

Just for example: A machine tool which cannot be tooled with carbides, hence would be a less-striking example, cost $7920 in 1939, would cost $13,905 in 1948. The new and improved model, introduced last year, is priced at $15,250—but will do 50% more work than the old. In another case, the old machine sold for $6835 in 1939, and for $10,855 in 1948. The new model, introduced last year, sells for $15,365—but is 66 2/3% faster than the old.

In the first case, the new machine costs 10% more, but does 50% more. In the second, the new machine costs 41% more, but does 66 2/3% more. And this is without comparison of labor costs, relative floorspace, and the like.

With units susceptible to spindle multiplication and carbide tooling, the change is much more appreciable. For example, a drive pinion can now be turned in 8.5 sec complete—or 17 sec floor to floor. Only a few years ago, such a piece would take 20 min or more. The answer is principally in reduced labor and handling. And for those who see in this the spectre of "technological unemployment," consider the fact that in 1900 there was no automotive industry, in 1938 it employed 306,000 men in plants and in 1948 it employed 770,000. That doesn't include the service men, service-station attendants,



PAYS OUT IN 13 MONTHS This CI bevel-gear blank was formerly made on 11 machines with 8 operators (1 basic and 5 secondary operations). It is now made on 3 machines with 1 operator. Time per piece is cut from 7.19 min to 1.1 min mantime. Not only has there been substantial saving in direct labor, but also scrap has been reduced enormously, high maintenance cost on obsolete equipment has been eliminated and floor space has been cut 600 sq. ft. Savings in direct labor and scrap will make the new equipment pay for itself in 13 months. If floorspace rental and reduced maintenance were considered, the time could be reduced substantially

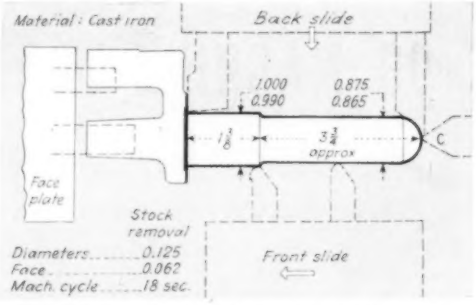
road builders—or to be facetious, the tax collectors who collect 5 cents on every gallon of gas plus $260 tax on a new Packard, etc., etc.

Conservative opinion after the 1947 Machine Tool Show was that the new models shown there averaged one-third faster than their wartime counterparts—an indication of the current acceleration of obsolescence.

To make the most striking comparisons, let's go back sixty years—to 1890, when carbon steel tools and belt drives were standard. With such a wide spread, it is difficult to give a true comparison. Some modern materials are so much harder and tougher to cut that the 1890 machine tool couldn't pull a tool through them—if the tool could have then been found that would stand up.

Through the years have come high-speed steel, then carbides; machines have become more rigid, more positive drives and transmissions have been developed, and power has been multiplied many times over. Machines have been "doubled up"—made multi-spindle, several operations combined (i.e., turning and threading) on one unit, or equipped with continuous feeding fixtures. Both tools and machines have been tremendously improved—so much so that even the rather sharp price increases of the last three or four years are more than balanced. In many cases finish is so much improved that finishing operations are no longer required.

In 1890, surface speeds were 49 fpm for wrought iron, 14 fpm for machinery steel. Jones & Lamson quoted 10 fpm for turning tool steel—as compared with 1185 fpm on the fastest Fay lathe. Present plans are to go to 1500 fpm, and Monarch Machine Tool Co., has successfully operated a lathe at 1650 fpm, with feed 0.015 in. per rev, depth of cut 5/16 in. and metal removal of 140 cu ipm. Hp required was 84. Planing, meantime, has increased from 40 fpm to as much as 300 fpm on semi-steel castings.

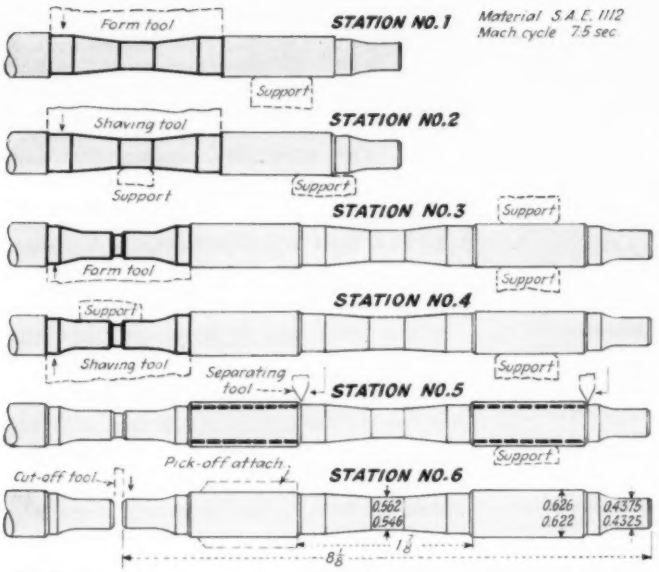


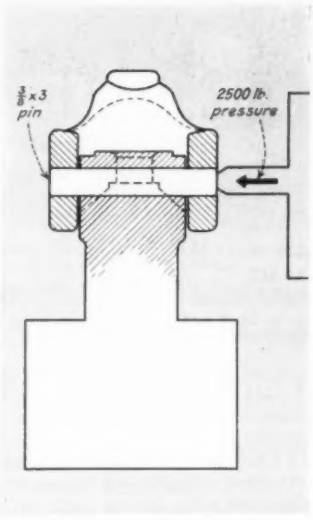
PAYS OUT IN 11 MONTHS This CI part formerly required 9 machines, with 6 operators and 3 operations. It is now made with 2 machines and 1 operator in 1 operation. Mantime per piece is cut from 1.05 min to 0.35. Direct-labor savings alone will pay for the new equipment in about 11 months. There is further saving in maintenance of obsolete equipment and in floor space and scrap

A 36-in. vertical boring mill, single head, cost only $1200 in 1890, but sells for $19,735 today—16½ times as much! That's quite an increase. But now let's consider the relative productivity of the two machines—for they are similar only in name:

In those days, machine operators got 18 cents an hour, top toolmakers 23 cents, as compared with $1.93 and $2.38 per hour in one New England shop today. We picked one typical job of the Nineties for comparison. **To have made in one day in 1890 the quantity which today's machine will do in that time would require an investment of $60,000, as compared with today's $20,000; and the labor cost then, at $0.18 per hour, would have been $44, as compared with $16 at today's $2 per hour.**

Or again—take a car-wheel lathe. In 1890, such a machine cost $7000 to $8000. Now it costs $35,000





TIME CUT 87.5% By the old method, a battery of basic and secondary operation machines performed one basic and three secondary operations in a total of 4 min per piece. Now, three basic-operation machines perform one operation in 0.5 min. Time saved in direct labor alone would pay for the equipment in 16 months, but purchase of the new equipment saved rebuilding of six old machines, so the new equipment is considered as paid for in less than one year. Substantial savings were made in floor space in the automatic screw-machine department as well

ASSEMBLY AUTOMATIZED This bracket and pin were formerly assembled manually in 0.7 min, are now assembled in a hydraulic-cylinder fixture in 0.3 min per piece. At this rate, the equipment will pay for itself in about 10 months

to $40,000. But the old machine cut at 6 to 9 fpm; the new one will cut at 250 to 300 fpm. In other words, **cost is five times as great, cutting speed 30 to 50 times as great.** This is based on wheels ranging from 250 to 365 Brinell, and cuts of 3/16 to 5/16 in. on the tread and up to ½ in. on the hub. Feeds are 0.031 to 0.041 in. per revolution—giving a time on one wheel of 6 1/3 minutes—a day's work in 1890.

In 1890, a typical 20-in. engine lathe was a single back-geared cone pulley machine that sold for $440 and delivered 1 hp. The same make present-day model is a heavy-duty tool that delivers 30 hp and sells for $8960. Thus price, not counting the change in value of the dollar, is 20.3 times as great. But delivered horsepower is related directly to volume of metal removed at normal cutting speeds, so if both machines were loaded to capacity, the new machine would do 30 times the work of the old. The cost relationship would be $13,200 to $8960, and labor cost would be $9 to $2. Discounting the change in value of the dollar—which would make the divergence greater, **the old units took say, 20 times the floor space, cost 4½ times as much for labor—and initial cost was 47% more.**

This comparison does not consider loading and unloading times. If the modern lathe were equipped with pneumatic chuck and similar accessories, idle-time savings would be in the same proportion.

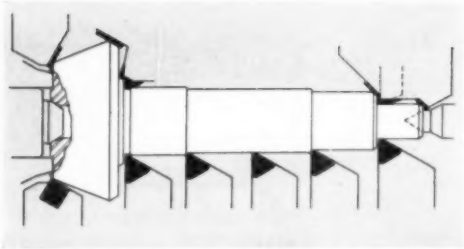
To draw a more normal picture, let's take a shorter span—25 years—and a couple of common products of a very common machine. First, a screw made from 11/32-in. brass. In 1924, it was made on a Brown & Sharpe No. OG automatic screw machine at a rate of 600 pieces per hour. The machine cost $1,950, was tooled with carbon steel, had a slotting attachment.

In 1949, the same part would be made on the new B. & S. No. 00G automatic screw threading machine at a rate of 3,600 per hour—or six times as fast. The modern machine, tooled with carbide, costs $4,425—or about twice as much. **To equal production of the new machine, the 1925 investment would have been $11,700, or 2.6 times as much.** Detail times are shown in the frontispiece.

Next, let's take a small steel part, made from ¼-in. stock, with ¼ in. threaded ¼-24 and a ⅛-in. shank 3/16 in. in dia.

In 1924, the stock was ¼-in. B7B or SAE1112 CRS. The machine was a Brown & Sharpe No. 00G regular automatic screw machine with slotting attachment and attachment belt-driving stand. Production was 290 per hour. The machine cost $1,525, and was tooled with carbon steel.

In 1949, the same part would be made of ¼-in.



CUT IN 8.5 SEC In this 16-in. Fay automatic lathe setup, an automotive driving pinion is completed in one operation. Turning feed is 0.0148 in. per rev, facing feed 0.012 in. per rev. 66 hp are used at 1200 rpm to attain a maximum cutting speed of 1185 fpm, with 8.5-sec cutting time, 17 sec floor-to-floor time

B-1113 or B & S 12A on a No. 00G high-speed automatic screw machine with motor drive and slotting attachment and carbide tooled. **Production would be 1,028 per hour—or 3½ times as much—for an investment of $4,070—or 2½ times as much. To produce the same output with 1924 machines would require an investment of $5,398.50—or 1/3 more.**

In the first of these two cases—that of the brass screw, much of the gain results from the development of the new specialized screw-threading machine. In the second case, the increase is a result of the great increase in available forward and backward speeds, as well as to such things as carbides, chain drive and self-opening dieheads.

In these two examples, labor has not been considered, because screw machines are operated in batteries, instead of as single machines. Further, a modern screw machine attains full efficiency only when a rod feed magazine is employed. Figures allowing for these complications would make parallels between 1924 and 1949 extremely tenuous. If you want to make labor cost comparisons, the going rate in 1924 for screw-machine operators was about 50 cents an hour or about a third of the current rate. Based on a conventional total of 50,000 pieces (gross), the brass piece would have required 83.33 hr in 1924, only 13.88 hr in 1949; the steel piece 174.10 hr in 1924, only 48.60 hr in 1949. **Assuming a wage increase from 50 cents per hr in 1924 to $1.65 today, labor cost would drop from $41.67 to $22.90 in the first case, from $87.05 to $80.19 in the second.**

Comparative figures become extremely interesting if allowances for the change in the value of the dollar are introduced. Let's adjust these last two figures in accordance with the "Purchasing Value of the Dollar" statistics of the National Industrial Conference Board, for August, 1948. The $11,700 investment of 1924 for the brass piece becomes $16,155.29, and the $5,398.50 for the steel piece becomes $7,454.22. **Thus the investment, in 1948 dollars, to equal 1949 production on 1924 equipment would be, respectively, 3.65 and 1.83 times as great.**

Current advertising gives comparisons of latest machines, so there is little point in detailing them here. Suffice it to say that most postwar machine tools are much faster and more powerful than their wartime counterparts. One amusing instance will indicate this development. About a year ago, Bullard Company received an order for five "Cutmaster" vertical turret lathes. The customer, after three were delivered, cancelled the other two. Inquiry brought out that the order had been figured on the basis of wartime machines; the three new ones could do as much as five wartime units. In another case, shifting a gear hub from a vertical turret lathe with fixture to a vertical turret lathe with Man-Au-Trol cut the time from 20 to 5 minutes.

In one recent case, 20 brass parts were being made on six 20-yr-old turret lathes. They were replaced with four new units of the same make, because the return on the investment was 26%. The four new machine tools cost $6,500 each, or $26,000, of which $400 was recovered by sale of the old machines. In this case, incidentally, tooling was practically unchanged—the savings were made by the greater power and higher speed of the new units. **Direct-labor saving alone was $6,600 per year.**

Mention was made earlier of multiple spindling as a source of savings. Here is a case in point: An automotive company ground the four main bearings of a crankshaft on four separate single-wheel grinders. Each machine produced 60 pieces per day, at a cost of $0.64 per shaft—a total of 240 pieces. A new machine, costing $48,000, now produces 250 pieces per day, at a direct labor cost of $0.16 each. Labor cost was cut from $153.600 (for 240 pieces) to $38.40—a saving of $115.20 per day, or $30,000 per year. **Thus the machine paid for itself in 1.6 years, and saved 62½% per year,** although the obsolete units were scrapped at no recovery value. In addition, no allowance has been made in this calculation for reduced scrap or recovered floor space.

Overload Eliminated

In one recent case, a 2-in., 6-spindle, automatic bar machine was replaced with a new machine of the same type and size at a saving of 43.7%. The user's requirements increased to 35,000 pieces per month, requiring 814 hr to make—more than the old machine could be run. The new machine could make the same number of parts in 307 hr, saving 507 hr per month or 6,084 hr per year. Labor cost was $26.62 per 1000 for the old machine, $10.04 for the new, a direct saving of $6,963.60 per year. Also, secondary operations were eliminated that required 450 hr at $1.482 per hr, saving an additional $666.90. Total savings thus were $7,630.50. The new machine, completely tooled, cost $17,461.25, so **amortization time was 2.29 years,** with no allowances for scrap value of the old unit or for reduced scrap.

Such instances might be stacked one atop the other endlessly. They would, however, merely reinforce our initial statement that if you believe new equipment costs too much, you are indulging in a fallacy. You can't meet the competition of tomorrow with the machine tools of yesterday.

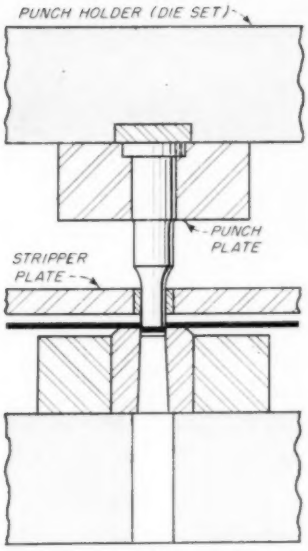


Fig. 1 . . A shoulder punch is the most efficient type for holes from 3/16- to ½-in. dia

HOW TO DESIGN SMALL PIERCING PUNCHES

At least one of the 14 types of punches sketched will be found suitable for almost any piercing operation, whether in low output or high-production dies

BY J. R. PAQUIN

MOST important consideration in design of small piercing punches is incorporation of sufficient strength in the body of the punch so repeated shock will not cause it to fracture. Another important requirement is easy access to the punch for sharpening and for replacement in case of breakage.

The illustrations show the most commonly used types of punches for the piercing or perforating of holes under 1¼ in. in dia. Here are their good points and limitations:

Punches for Three Hole Ranges

Fig. 1 illustrates the common shoulder punch, which is the most efficient type for piercing holes from 3/16 to ½ in. in dia and in both low- and high-speed die operations. Here the punch is guided in the stripper plate, which is preferable to no lateral support. Body of the punch is made a light press-fit in the punch plate and is relieved so that only the portion that bears in the punch plate is made to press-fit size. The radius, which leads from the body diameter to the cutting-end diameter, should be smooth, because ridges or marks present focal points for fracture after the punch has been hardened.

The punch should be made of a good grade of tool steel and hardened and ground. After the punch has been pressed into the punch plate, the top surface of both the punch plate and the shoulder of the punch are ground.

For holes from ½- to 1¼-in. dia, the body of the punch, Fig. 2, is straight from the underside of the punch plate to the cutting end. Press-fit relief, however, has been applied. For punches greater in diameter than 1¼ in., the punch face, Fig. 3, is relieved to reduce grinding surface in sharpening.

Where production requirements and press speeds are low, the punch illustrated in Fig. 4 will be found satisfactory. It is made of drillrod, and the body is peened over into a countersunk recess in

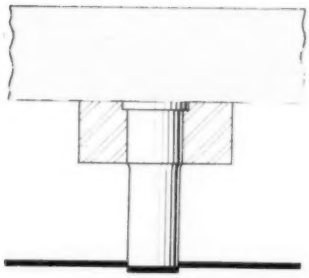


Fig. 2 . . A straight punch is best for holes of ½ to 1¼ in. It has press-fit relief

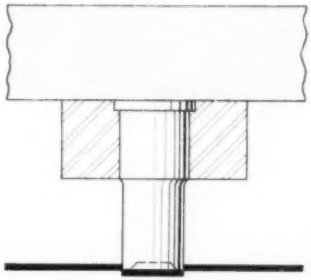


Fig. 3 . . Relief of the cutting face minimizes grinding for punches over 1¼ in. dia.

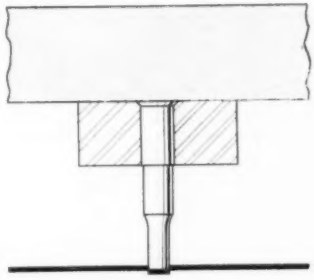


Fig. 4 . . A drillrod punch peened into the punch-plate recess is adequate for low-speed, low-production uses

the punch plate. Then, the punch plate and the top surface of the punch body are ground together.

To Prevent Rotation

Two methods of preventing punch rotation, Figs. 5 and 6, are shown for punches that are not round at the cutting face. In Fig. 5, a dowel has been pressed into the punch plate and partly into the head of the punch. Using a dowel to prevent punch rotation in this manner is satisfactory for low-production and low-speed requirements. For high production and high speed, the method illustrated in Fig. 6 is preferred. Here, a slot is machined in the punch plate, and a flat is ground on the punch head to bear on the side of the slot.

Low Accuracy

Where low-production and low-accuracy requirements exist, the style of punch shown in Figs. 7 and 8 may be used. These punches are made of drillrod, machined to size at the cutting end. An angular flat is machined on the body against which the point of a setscrew bears. When several punches are contained in the same punch plate, and the distance from the punch to the edge of the punch plate is too great for standard setscrew lengths, a drillrod pin is used to bridge the distance, as shown in Fig. 8.

The punch shown in Fig. 9 is used for light stock. It is made of drill rod, and the head is peened over and backed up by a hardened plate, which is recessed into the punch holder. The cutting end is guided in a hardened bushing pressed into the stripper plate. When light-gage steel, brass or aluminum are to be perforated, this type of punch will give outstanding service. If several punches must be used, with close center distances, it is often the only type that can be used. This condition is shown in Fig. 10.

Fig. 11 illustrates the construction of a pin punch held in a quill, and guided directly in a hardened bushing in the stripper plate. Both the punch and the quill are backed by a hardened plate. This construction is particularly useful for small-diameter punches. A similar design is shown in Fig. 12, but here the quill is guided in the stripper plate and only enough of the punch protrudes from the quill to pierce the stock and allow for a certain amount of sharpening.

Quill punches are made of drillrod. They are cheaply replaced

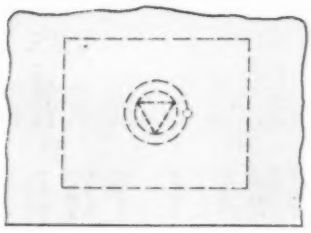


Fig. 5 . . Rotation of punches can be prevented with a dowel

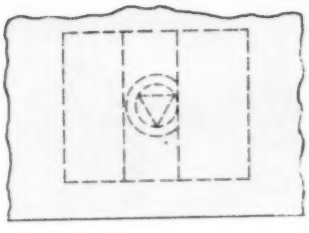


Fig. 6 . . A flat on the punch head is more positive for high-speed dies

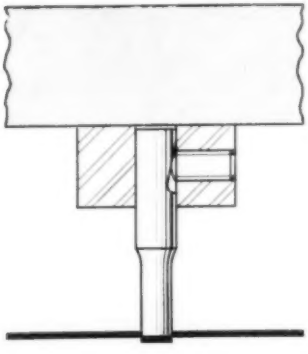


Fig. 7 . . A setscrew will suffice to hold the punch in low-production dies

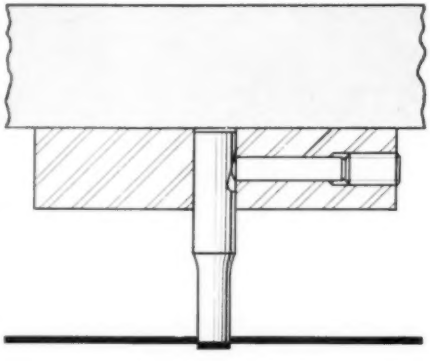
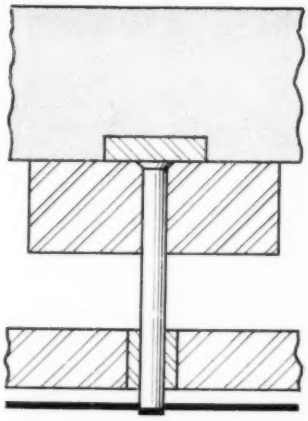


Fig. 8 . . A drillrod pin bridges the distance, when a deep hole must be drilled



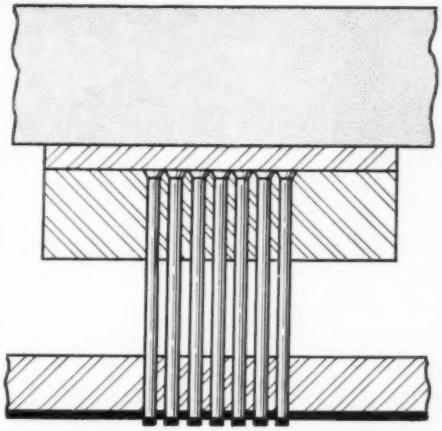


Fig. 9 . . Light drillrod punches are guided in the stripper plate to prevent buckling

Fig. 10 . . . Several punches can be set at close center distances

and the quill supports the punch in operation to prevent buckling.

Where center distances of quill punches are close together, two or more punches may be held in the same quill. The quill is then guided in the stripper plate. This condition is shown in Fig. 13. The head of the quill must be prevented from turning. A flat machined on the shoulder of the quill bears on one side of a slot previously machined in the punch plate.

Bit Punch

The standard bit punch shown in Fig. 14 is held in a quill, and backed up by a hardened and ground rod. The two components are held in another quill pressed into the punch plate. Bit punches allow the use of the highest grades of alloy tool steels in their construction at a cost comparable to making the entire punch solid of cheaper steel.

General

At least one of the punches described will be found applicable in the great majority of piercing operations, and for all classes of cutting dies. If care is used in the selection of the proper punch for the job at hand; and it is designed for the utmost strength commensurate with space limitations, trouble-free operation on the press line will be assured.

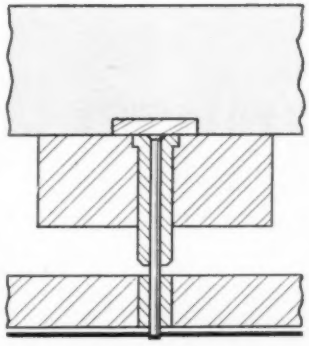


Fig. 11 . . A quill is useful for supporting pin punches

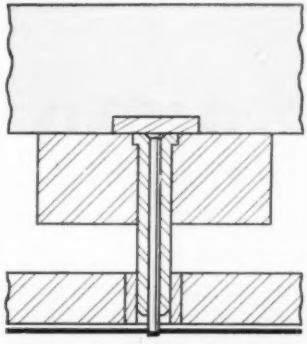


Fig. 12 . . A bushing in the stripper plate guides the quill for greater punch support

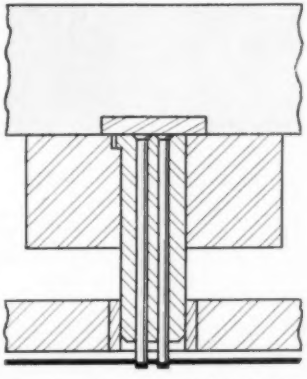


Fig. 13 . . Quills are not limited to a single punch; if prevented from turning, they are used for pin punches at close centers

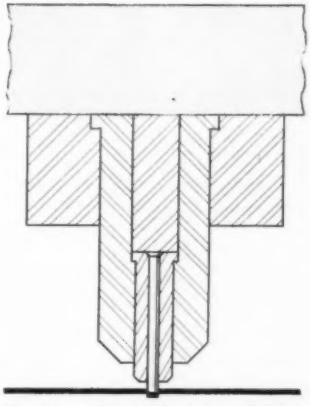
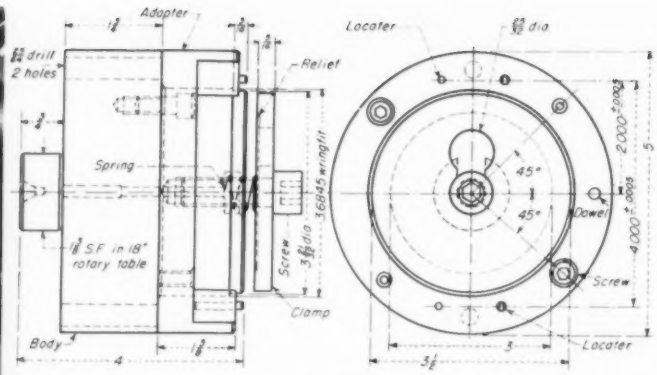
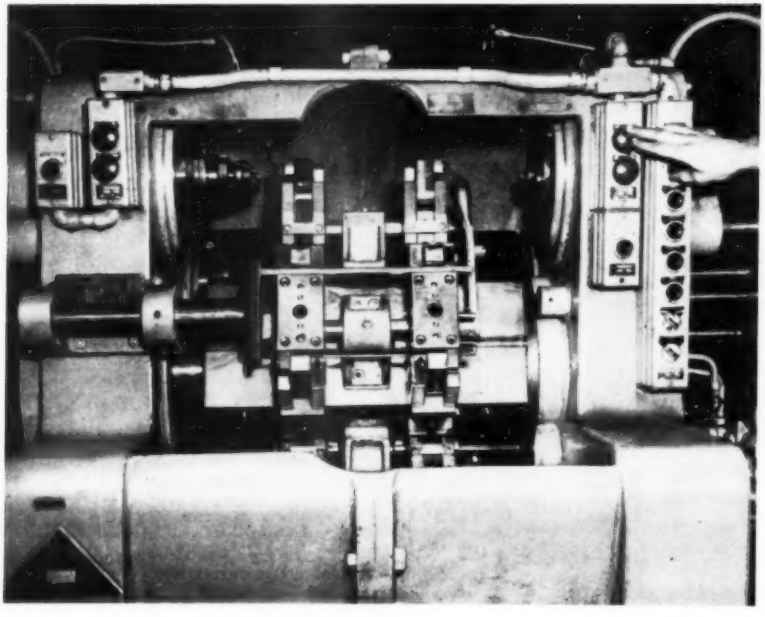


Fig. 14 . . Two quills are used for a bit punch; one to support the punch, and the second to support the inner quill, when a stripper is not used

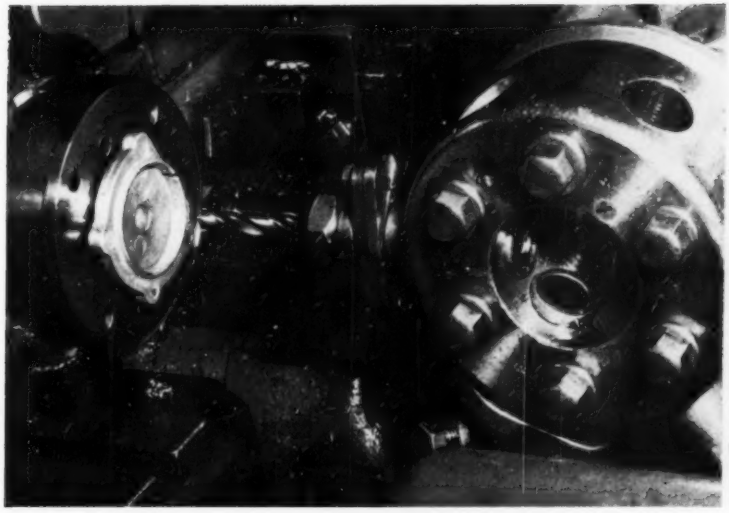


Type bars on electric typewriters are guided and pivoted in 42 radiating slots machined in cast-iron rings that are cut in half. A pair of sections is clamped in an indexing fixture on a Producto machine, eight of which can be loaded and unloaded in rotation by one operator. The reciprocating cutter, a 3-in. dished steel type, slices one slot at a time with the fixture indexing one position after each stroke. A few of the 0.0359- to 0.0364-in. slots are checked on each part with carbide "go" and "no-go" gages

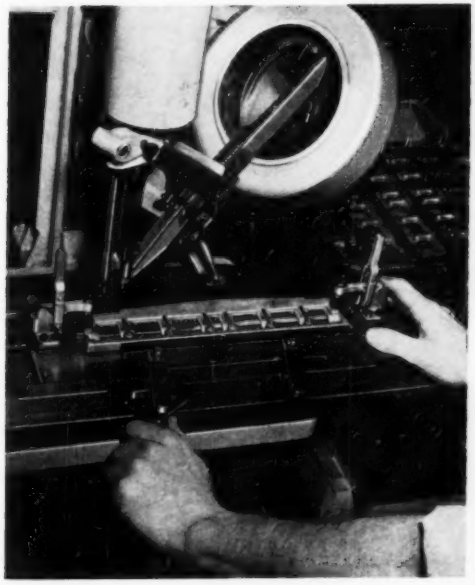
SHOP SHOTS at IBM



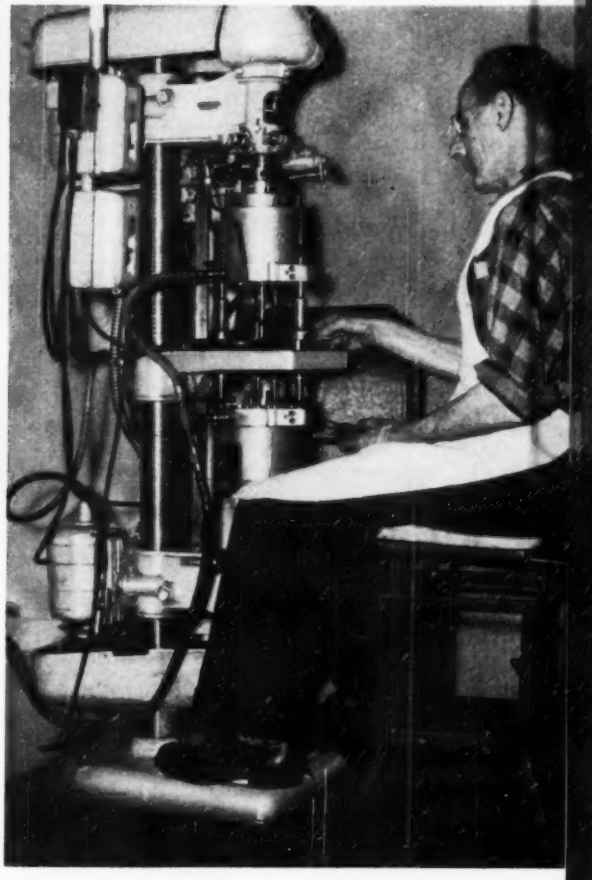
Two square-section bars are loaded on each double fixture on a special LeMaire machine, are located endwise by a fixed gage plate at the left of the loading station, and are hand-clamped before the cycle can start. Air clamps complete location as the turret rotates about a horizontal axis. First work station hollow-mills both ends of both bars; second station finishes the milling, and third station die-threads the ends. At last station, bars are ejected and fixtures are cleared for loading. New machine increases old screw-machine output by 18 times



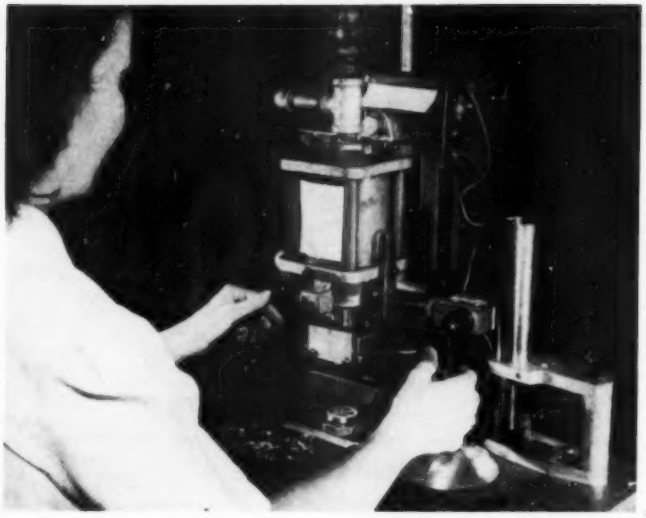
Indirect hand loading feeds small aluminum die castings to a B&S single-spindle screw machine The flanged part is set on an arbor in the turret, which fits the cored hole. Then a turret movement sets the part in a collet in the spindle, the collet closes on the part, and the arbor is withdrawn—all without the spindle stopping. All-carbide tooling counterbores, chamfers, bores, and reams the casting

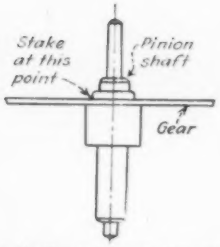


Straight-line lever action indexes flat plates for typewriter assembly under Detroit automatic screwdriver. Rotating hopper feeds screws down carrier to driver jaws, which are lowered by pedal action. The sliding fixture is positioned automatically by the indexing mechanism that works on notches in the fixture. All 42 screws for each plate are inserted against side pressure from a rubber strip that locks them in place

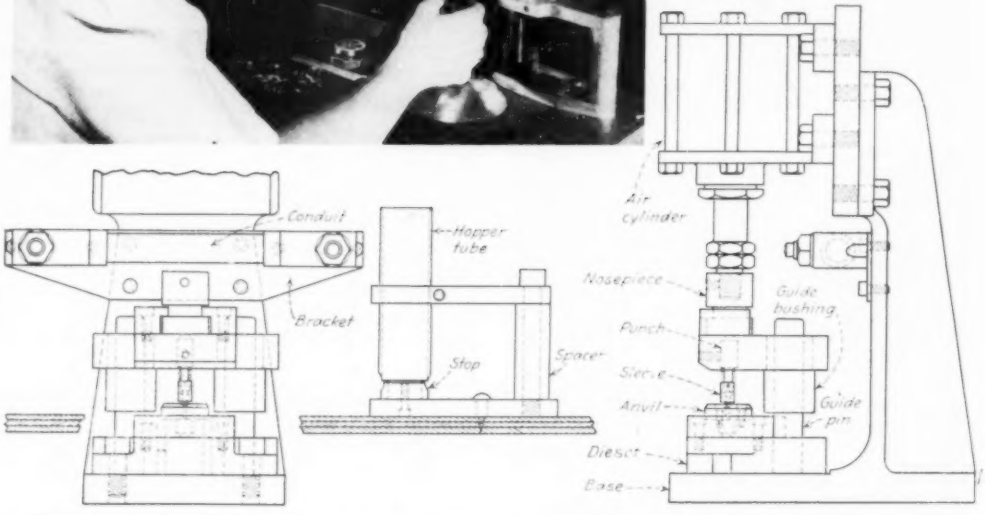


Both top and bottom edges of blanked and pierced holes in steel plates are countersunk simultaneously by linked gearless drillheads on a Delta drill. The upright and the inverted heads are on the same column. A simple notched fixture locates each part for the operation





Pinion shafts and gears for register gear trains are joined by 3-in. Hannifin cylinder with 1-in. stroke. Staked assemblies are dropped through funnel under operator's right hand. This setup can be retooled for two other gear assemblies



Tooling for pinion shafts and gears is typical of most air-press setups. Punch-and-die assemblies are built into Danly diesets so guide pins assure alignment. Gear hopper is cut away on two sides so operator can pull out one gear at a time. Microswitches in series actuate solenoid and valve at rear of cylinder

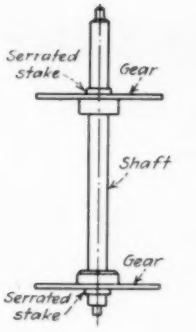
Air Presses Punch Instrument Components

BY JOHN A. MUIR, General Superintendent, SANGAMO ELECTRIC COMPANY

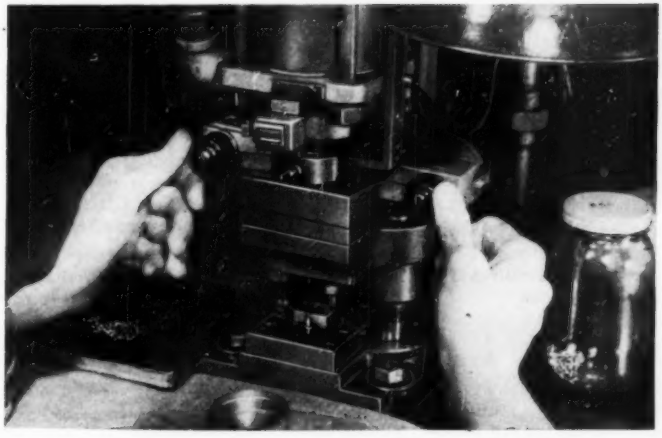
Accuracy, production, and operator efficiency were all increased when Sangamo substituted bench-type, air-cylinder presses for kick and hand presses.

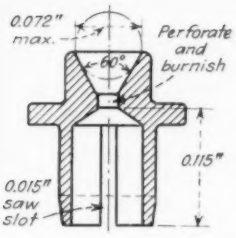
Double-acting cylinders are supported vertically by cast-iron bases.

Staking, piercing, and burnishing operations are handled by standard subpress punch-and-die sets with small-scale tooling

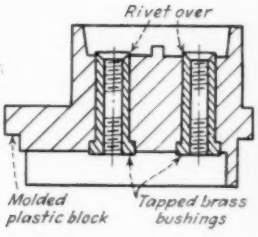


Spring-loaded fingers support a double-end shaft between punch and die for double staking action. Top gear is placed on shaft, lower one on die. After the stroke, spring tosses assembly forward into box

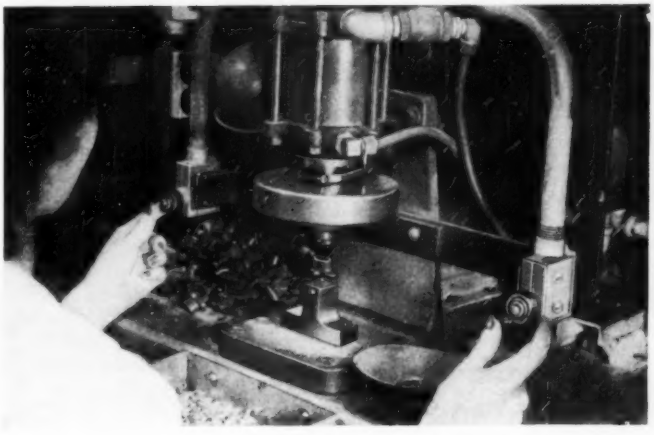


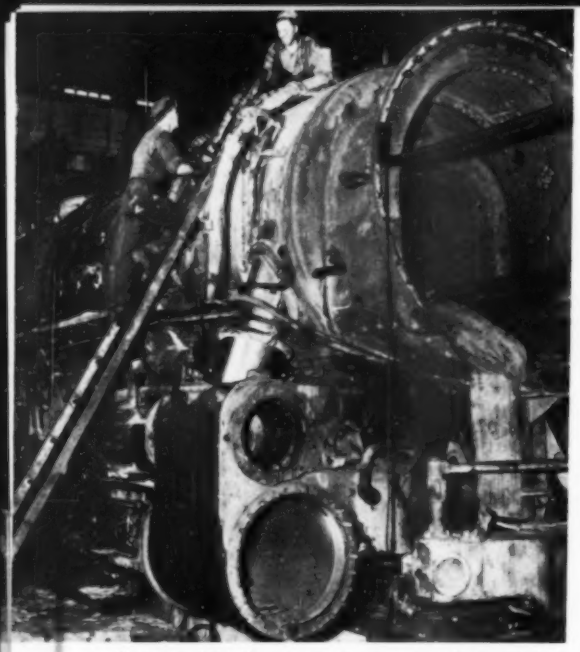


Tiny bronze sleeves, so small they are carried between operations in jars, are pierced and burnished to fit 1/16-in. balls in their top bores. Operator handles the cylindrical parts with tweezers, and a counter on the press checks quantities going through the cycle



Cylindrical weight, 5x1⅛ in., increases momentum of piston rod for riveting two brass bushings into plastic block. Operator sets two bushings in die, then slips plastic over them. Press force peens over both ends of both bushings for permanent lock





Personal Attention—A N. Y. C. apprentice assists a machinist (on ladder), to whom he is assigned for instruction, in applying superheater units to a locomotive. The apprentice is a decorated artillery veteran

Today's Apprentices Will Handle Tomorrow's RR Shops

Railroads, adding more and more complex equipment, are assuring its long life by training competent maintenance mechanics. Here are methods in use by the New York Central and Union Pacific

BY E. J. TANGERMAN, MANAGING EDITOR

TO KEEP locomotives, rolling stock, and equipment in top notch condition, American railroads have on the job in their maintenance shops more than 370,000 workers. Approximately half are skilled mechanics — machinists, boilermakers, blacksmiths, sheet-metal workers, electricians and carmen. To maintain a skilled work force of this size, a continuous flow of young men must be fed into the ranks through apprenticeship.

War seriously affected apprentice programs, but the railroads have been making up for lost time since VJ Day. In the forefront have been the New York Central, with its eight affiliated companies, and the Union Pacific, followed closely by the Western Pacific, Lehigh Valley and the Central Railroad of New Jersey with its affiliate, the Central Railroad of Pennsylvania. Management and labor of each railroad have cooperated in the revitalization and modernization of its system of apprenticeship. Each system has been established in accordance with standards of the Federal Committee on Apprenticeship, the national policy - recommending body for the Labor Department's Bureau of Apprenticeship. Field representatives of that bureau assisted the railroads in setting up the systems.

It is anticipated that all railroads will eventually take part in this joint undertaking in apprenticeship.

2,336 Apprentices in Training

Some 2,336 apprentices were in training in January in the shops of the five participating railroads. Included are 918 machinist apprentices, 266 boilermaker ap-

Everybody Is Trained—Apprentice and journeyman both receive classroom instruction, one in theory, the other in teaching. Here U. P. boilermaker apprentices are being shown how knowledge supplements skill

prentices, 48 in the blacksmith trade, 200 in the sheet-metal craft, 304 in the electrical trade and 600 in the various carmen divisions. They are learning through carefully supervised experience on the job and related classroom instruction to master the wide variety of operations performed by craftsmen in the maintenance shops.

Approximately 70% of these apprentices are veterans. Some 30% of them have been granted credits on the apprenticeship term for previous experience in the shop crafts during or prior to military service. Credits range from one month to nearly two years, and are enabling these veterans to complete their apprenticeship ahead of schedule. In addition to apprentice wages paid by employers, these former servicemen have the benefit of monthly subsistence payments provided by veterans' legislation.

Apprenticeship Committees

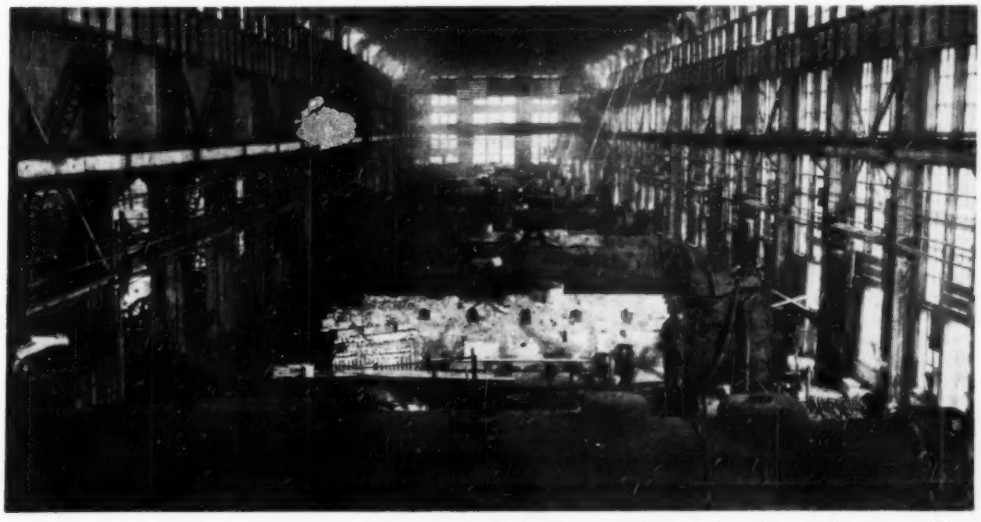
Directing the apprenticeship system of each railroad company is a General Apprenticeship Committee, equally representative of management and the AFL. Among duties of this committee are the determination of policies on all matters related to apprenticeship, the formulation of rules and regulations in administering the program, registration of memoranda with respect to apprenticeship agreements, and the preparation of reports on the progress of apprenticeship activities, copies of which are transmitted to the Bureau of Apprenticeship in Washington.

The chairman and secretary of the General Apprenticeship Committee of each railroad are: New York Central: T. J. Lyon, superintendent of equipment, Lines East, and J. Rieber, secretary, System Federation, No. 103; Union Pacific: F. J. Hason, engineer, Locomotive & Car Maintenance, and F. W. Burke, president, System Federation No. 105; Western Pacific: E. E. Gleason, superintendent, Motive Power & Machinery and Alex Bauer, president, System Federation No. 117; Lehigh Valley: W. E. Lehr, superintendent of Motive Power, and J. P. McSparron, general chairman, Machinists; Central Railroad of New Jersey: E. E. Cavany, supervisor of apprentice training, and R. H. Moran, president, System Federation No. 72.

Cooperating with and reporting to the general committee are local joint apprenticeship committees which function in an advisory capacity. In each shop of the Union Pacific, an apprentice coordinator has the responsibility of coordinating the apprenticeship program in all crafts, in cooperation with the local committee and foremen. In the larger shops of the New York Central, an apprentice supervisor shoulders this responsibility. Apprentices are under the direct supervision and direction of foremen and journeymen to whom they are assigned.

Three Types of Apprentices

Two types of apprentices are employed by these railroads: regular and helper apprentices; and the New York Central employs, in addition, a third type, known as special apprentices. Regular apprentices are those with little or no previous experience as maintenance mechanics, and usually high school graduates. Helper apprentices are those who have had at least two years experience as helpers in one or more of the shop crafts. Special apprentices are either graduates of engineering colleges or university graduates who have had some engineering education. These young men are given the advantage of some experience as apprentices in preparation for supervisory positions.



Proving Ground—Railroad apprentices work under actual shop conditions as in the Collingwood, Ohio, locomotive shop of the New York Central

The term of apprenticeship in each shop craft for regular apprentices is about four years; and three years for helper apprentices, who are granted one year of credit for their past experience.

Apprentice Work Schedule

In each trade, apprentices are given experience in the shops in one series of work processes after another; and are advanced in their wages as they complete each series. The work schedule and approximate time required in the machinist trade is exemplified by that adopted for regular apprentices by the Union Pacific Railroad, which is:

U.P. REGULAR MACHINIST APPRENTICE SCHEDULE

	Days, Approx
TOOL ROOM	24
MACHINE SHOP	
Drillpress	24
Turret lathe	24
Engine lathe	72
Boring mill	36
Shaper	24
Planer	24
Grinder (all types)	36
Slotter	12
Milling machines	12
STRIPPING GANG	
Dismantling locomotives	30
FRAME GANG	
Application frame sections	24
Lining guides	30
Spring & brake rigging	24
Shoes and wedges	30
FINISHING GANG	
Stokers and steam pipes	30
Cab work and throttles	30
Applying pistons, cylinder heads, boiler checks, etc	36
Valve-motion crossheads	30
AIR ROOM	
Air compressors	24
Injectors	18
Lubricators	12
Feedwater pumps	24
Air equipment	30
Fittings, gages, valves, etc.	24
Repairs air-conditioning equipment, Waukesha	36
MACHINE WORK	
Parts for diesel-electric	30
Gas-electric power units	24
Steam units	24
FLOOR WORK	
General floor work	70
Diesel-electric	70
Gas-electric and power units	24
Steam locomotives	72
Acetylene and electric welding	72
Valve setting	30
Layout table	24

After the first 72 days, the apprentice may be scheduled on any of the first three operations listed above, depending upon his ability to handle assignments and shop conditions.

Because every helper apprentice is given credit for one year of previous experience, the work schedule for each is determined when his experience and ability are evaluated.

Classroom Instruction

To supplement shop work, every apprentice must devote four hours a week to the classroom where he is instructed in subjects related to his work in the shop. Apprentices attend classes during regular working hours and are paid shop rates.

Classrooms are on company property, in or near the maintenance shops. Instructors are well qualified, selected because of their extensive experience in shop crafts. In addition to that experience, each has been given thorough instruction in the art of teaching.

In the classrooms, apprentices have the advantage of small working models, various parts of locomotives and cars, as well as air-brake, air-conditioning and testing equipment. Motion pictures on a variety of subjects are also used as visual aids. Technical reference books have been made available to apprentices, and reference libraries are also established at convenient points.

Instruction manuals have been prepared for the use of instructors. For the Union Pacific, for example, a manual entitled, "A Guide For Apprentice Instructors" was prepared by State Supervisors of Trade and Industrial Education of State Boards for Vocational Education and representatives of the U. S. Office of Education. Outlined in this volume is the classroom curriculum in each trade. The curriculum for machinist apprentices is set up under 56 packets giving the technical information on each individual machine and operation—drillpresses, lathes, shapers, milling and boring machines, grinders, planers, diesel and gas engines; welding, bench work, refrigeration and air conditioning, air room, erection shop, mathematics and blueprint reading.

Entrance and Periodic Tests

Applicants for apprenticeship are carefully selected. Before they are accepted, they are interviewed and examined by those in charge of the work in the shops as well as by representatives of the personnel departments of the railroad companies. They are interviewed usually by the apprentice supervisor in the shop in which they are to work; and in some instances by the superintendent of motive

Forging—A gear blank takes shape on a 10,000-lb. steam hammer in a Union Pacific shop, with a blacksmith apprentice at the tongs

Classwork—A class of N. Y. Central apprentices at the West Albany, N. Y., locomotive shops, receiving the related instruction which supplements shop training. Similar classwork is provided in all shops

power, the master mechanic, or a representative of the local apprenticeship committee. They are examined in the fundamental principles of mathematics, in English and other subjects related to the craft in which they are to be trained.

Each apprentice, when finally approved and accepted, signs an individual apprenticeship agreement which is also signed by a company official and a member of the local apprenticeship committee. Copies of the agreement are supplied to management and the General Committee on Apprenticeship. The names of each apprentice indentured, with age, birthplace and other pertinent data, are forwarded for registration to the Bureau of Apprenticeship in Washington, which in turn forwards copies of the lists to the State apprenticeship agencies in States in which apprentices are employed.

During his training every apprentice must pass periodic tests on his progress in the work in the shop and in the classroom. These tests, which are usually in written form, are given every six months, more often by some of the railroad companies.

Detailed records are kept of the progress of apprentices on the job and in the classroom. These records are maintained by an apprentice supervisor or instructor in cooperation with local apprenticeship committees which transmit the reports to the General Apprenticeship Committee.

New York Central System
THE NEW YORK CENTRAL RAILROAD COMPANY
Certificate of Apprenticeship
This is to Certify that JOHN DOE has served
his apprenticeship in the WEST ALBANY LOCO. Shops
of this Company with entire satisfaction and that he is now a
Journeyman of the MACHINIST Grade
GEN. SUPT. M. P. & R. S.
SUPT. OF SHOPS
ASST. TO G. S. M. P.
GEN. FOREMAN
MAY 9TH 1947
Certificate No. 167

Diploma—This certificate of apprenticeship, awarded by the New York Central, is typical of those awarded to railroad apprentices upon completion of their apprenticeship. All five railroads discussed in this article award similar "diplomas"

By March, 1949, 275 apprentices employed by these five railroads had completed their apprenticeship during the last two years and were working as full-fledged, all-round skilled mechanics. Each apprentice was awarded a certificate of completion of apprenticeship. These certificates, which are awarded to every apprentice upon completion, have the same significance as diplomas awarded graduates of universities and schools.

Benefits of Program

As a result of this well-balanced system of apprenticeship, the railroads will be assured at all times of an ample supply of highly skilled shop craftsmen. From their ranks will be drawn in future

Special Work, Too—A Union Pacific apprentice is instructed by his foreman in Magnafluxing a Diesel switcher drive gear and axle

Hand Skills Taught Too—A Union Pacific sheet-metal apprentice hammer-forms a copper steam table for a dining-car kitchen, under the guidance of his foreman

years the foremen, superintendents, shop managers and others in top-ranking positions. With respect to future opportunities for apprentices, W. E. Lehr, superintendent of motive power of the Lehigh Valley Railroad, says:

"We have long felt that an apprentice training program does not have as its sole purpose the ultimate filling of vacancies occurring in any craft; it has a much broader scope in that from these young men we can best obtain the future qualified supervisors, foremen and superintendents in conformance with the progressive advancement instituted by railroad management."

Many of those in executive positions in the railroads today started their careers as apprentices in the maintenance shops. Among officials of the New York Central, for example, who received their early training as apprentices are two members of the General Apprenticeship Committee, T. J. Lyon, chairman, who is superintendent of equipment, Lines East, and I. W. Martin, assistant to the general superintendent of motive power, New York; Superintendents of Equipment A. L. Wright, M. R. Benson and J. Salzgaber; Assistant Superintendents of Equipment C. F. Burns and R. R. Sneddon; Superintendents of Locomotive Shops W. M. Nagle, S. D. Foster and W. E. Buck; and Superintendent of Car Shops F. Kossuth.

Program Appraised

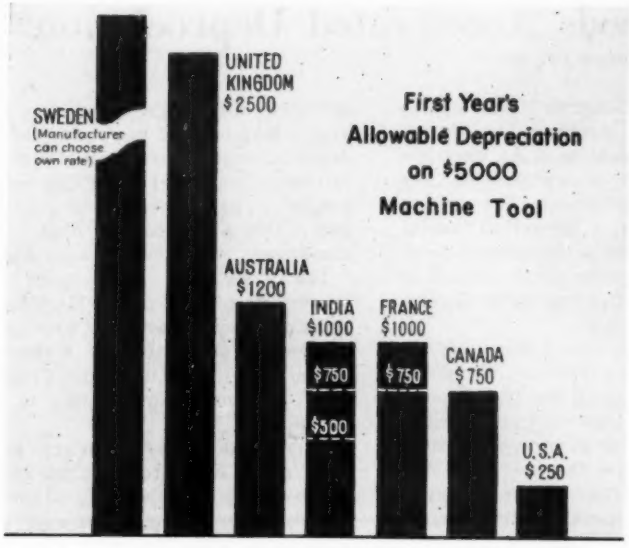
The success of the apprenticeship systems now adopted by these railroads is evidenced by the enthusiastic statements of officials.

"'In the modern shop," says L. W. Horning, vice president of the New York Central, "the training of apprentices must keep pace in every particular with enginering advancement. The modernized unified program of apprenticeship established to develop skilled maintenance workers, which trains young men to work intelligently with their hands, as well as their heads, is assuring us of that objective."

P. J. Lynch, vice president of the Union Pacific, has this to say: "The comprehensive, well-organized apprenticeship program we are now conducting is proving outstandingly successful. The establishment of the General Apprenticeship Committee with the cooperating local committees, shop and classroom instructors, assures us of uniformity and coordination of procedure and administration never before possible."

E. E. Gleason, superintendent of motive power and machinery, Western Pacific Railroad, states: "The apprenticeship program that we are now operating with the cooperation of the labor organizations, through its planned schedules of work in the shop and the tcehnical information in the classroom, will give us the highly skilled mechanics and supervisors needed to carry on the successful operation of the equipment."

G. H. Massy, superintendent, motive power and rolling stock, Central Railroad of New Jersey, says: "The apprentice training program has been most satisfactory. Under the program our apprentices are getting the benefit of on-the-job training as well as classroom instruction in the theoretical aspects of their work. This is an intelligent approach to the problem of an adequate supply of competent journeymen."



INDUSTRY NEEDS

Accelerated Depreciation

Quicker Write-Offs of New Machines Will Aid Cost-Reduction Programs

BY
BURNHAM FINNEY
Editor,
American Machinist

The United States Treasury clings, with little variation, to long-term tax writeoffs of new machinery, averaging 15-20 years. This policy hampers manufacturers in replacing old machines with new. It is in sharp contrast with high depreciation rates in Britain, France, Sweden, India, Canada, Australia. Congress should recognize the merits of accelerated depreciation by ordering the Treasury Department to put it into effect here

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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Industry Needs Accelerated Depreciation—NOW

THE TIME is at hand for Congress to pass legislation authorizing and directing the United States Treasury Department to grant more liberal rates for depreciation of new machine tools and other production equipment. The present policy of basing rates on a theoretical "useful service life" is as outmoded as the model T Ford. What is needed is a new policy which takes as its basis the "useful productive life" with obsolescence as an important factor.

Even more to the point, manufacturers should be given the right to choose the time limit within which they wish to write off for tax purposes their new equipment. If they want to depreciate the entire cost of a machine in two years instead of fifteen, they should have that privilege. And the burden of proof that they have not done the right thing should be on the tax authorities, not upon them.

But once a manufacturer has arrived at the number of years he wishes to take in charging off his equipment, he should stick with his decision over a period of years. He should not be permitted to shift from year to year as his whim fancies.

If the policy of allowing accelerated depreciation should become the law of the land, and preferably a free choice were given the manufacturer in determining the length of time for machinery write-offs, a giant step would have been taken toward encouraging American industry to modernize its production equipment. One of the restraints imposed upon purchase of new cost-reducing machinery has been the government's archaic practice of insisting upon manufacturers spreading their depreciation for tax purposes over a long term of years. In most cases, such depreciation must be allocated over some fifteen to twenty years. Yet when that machinery was bought, it had to pay for itself in production savings within a much shorter time. Otherwise the management would not have invested in it.

That is even more to the point today than it was five to ten years ago. Machinery users are insisting upon a pay-off of new equipment, in the form of cost-cutting, in a remarkably brief period. But the United States Treasury Department is adamant in adhering to a long-term write-off.

This unrealistic approach acts as a powerful deterrent to new machinery purchases. As long as a company is compelled to carry machinery on its books for tax purposes over a substantial number of years, listing it as an asset after it often has become a liability, the management hesitates to invest in new machinery. Permission for a quick write-off would have the opposite effect. It would speed replacement of obsolete equipment when cost reduction is paramount.

Obsolescence Is Increasing

The nation's metalworking industries today have more machine tools and other production equipment over ten years old than they had at the end of World War II. And a surprisingly large proportion of the total units installed are more than twenty years of age. In the past five years the country has lost ground.

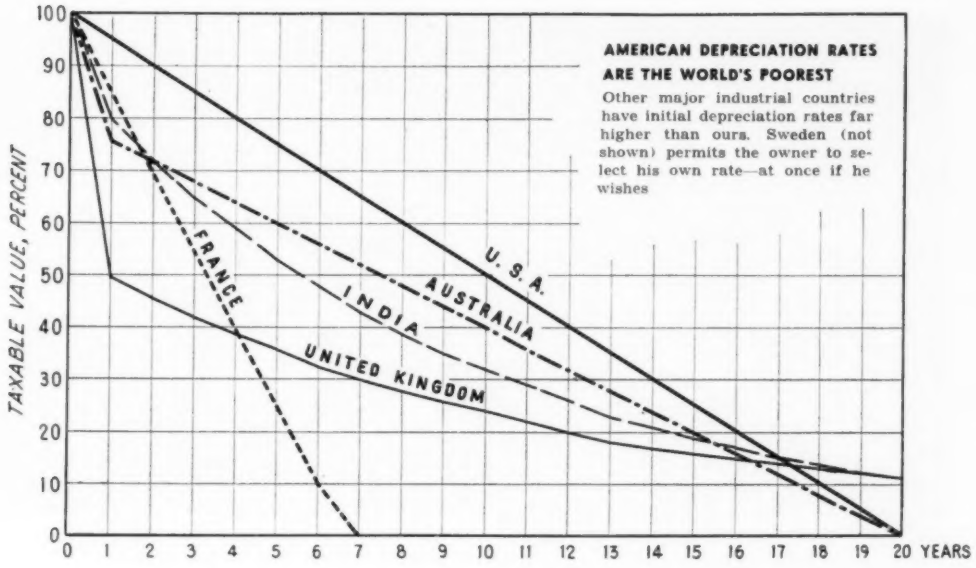
That is an ominous trend for two reasons: (1) it bodes ill for the improvement in efficiency and productivity so necessary if current high wage rates are to be maintained and if prices of goods are to be reduced to the consumer; and (2) it weakens our national security which is so dependent upon our vaunted industrial superiority.

A radical and immediate change in the depreciation policy permitted by the Treasury Department will go a long way toward correcting this disturbing situation. A sweeping liberalization, granting the privilege of writing off new equipment speedily, is the best and most practical means of accomplishing the objective.

Members of President Truman's cabinet and some members of Congress are fully aware of the need for such a program. Secretary of Commerce Charles Sawyer was made conscious of industry's desire for an accelerated depreciation policy when he recently visited New England

MAPI MEMBERS FAVOR SPEEDIER WRITE-OFFS

Sixty-five percent of the members of the Machinery & Allied Products Institute who responded to a questionnaire on their replacement and depreciation policies declared that they would write off their new machine tools and other production equipment in ten years or less if the government would permit such a policy. In contrast, 74 percent say that present tax practices make it necessary for them to spread depreciation out over 12 to 20 years. The Institute believes that this survey is representative of capital goods manufacturers in general


AMERICAN DEPRECIATION RATES ARE THE WORLD'S POOREST
Other major industrial countries have initial depreciation rates far higher than ours. Sweden (not shown) permits the owner to select his own rate—at once if he wishes
TAXABLE VALUE, PERCENT
YEARS
U. S. A.
AUSTRALIA
INDIA
FRANCE
UNITED KINGDOM

and talked with groups of industrialists regarding business conditions and what can and should be done to aid industry.

Dozens of members of Congress have worked up schemes for easing depreciation rules. Senator James Murray's "Economic Expansion Act of 1949", successor to the Spence Bill, has a provision for rapid amortization. The bill would allow taxpayers to elect, upon receipt of a certificate of approval from a Presidentially appointed committee, deductions for amortization over any period of not less than sixty months. If assets have a life of less than sixty months, the taxpayer may take a period of one-half of the depreciation period allowable under present rules.

The total deduction for amortization, of course, shall not exceed the total deductions now allowable. Only the time interval is changed by being shortened. Moreover, a taxpayer may not change his base, after he has chosen it. Once the taxpayer decides to accelerate his depreciation, he may continue to use his chosen basis until the process is completed, regardless of whether the President decides to suspend the grant of further acceleration privileges.

Many other bills pertaining to accelerated depreciation are before the United States Senate. Representative Lane of Massachusetts, Democrat, has introduced a bill (H.R. 3897) which will permit a manufacturer to amortize his investment in new equipment over a period of sixty months. Representative Church of Illinois, Republican, would grant in his bill (H.R. 4543) a special amortization allowance of ten years or more for "productive facilities in any basic industry essential to national security which the President . . . officially declares to have capacity less than needed for security reasons."

Representative Patman of Texas, Democrat, is sponsor of a bill (H.R. 5696) providing for an amortization period of as little as sixty months, or one-half the present rate of depreciation if normal life is shorter. A manufacturer would have to get a certificate of approval from the government to make use of the accelerated rate. Senator Capehart of Indiana, Republican, and Senator Tobey of New Hampshire, Republican, have each introduced bills in the Senate identical with the House bill of Representative Lane.

Besides the measures just cited, a number of bills are pending which would make specific depreciation allowances for specific types of equipment, such as merchant shipping, steel plants and synthetic liquid fuels.

Though bills now before Congress provide for a relatively short period of depreciation if a manufacturer so elects, some senators believe that a longer time limit should be prescribed. That time limit, however, would be far shorter than the depreciation timetable now operated by the United States Treasury Department.

Senator Walter F. George of Georgia, Democrat, chairman of the Senate Finance Committee, for example, feels that under present conditions a ten-year depreciation period comes closest to being a solution to the unsatisfactory situation.

***UNITED KINGDOM**—Half the cost of new equipment for making Ferguson tractor parts at Standard Motor Co., Ltd., in England can be written off for tax purposes the first year*

The point is that, as already stated, members of Congress are beginning to realize the necessity for action to change the depreciation tax rules to which the Treasury Department desperately clings. The truth is that accelerated depreciation is not new. And the idea of letting a manufacturer fix his own depreciation rate on new machinery is not new.

Prior to the year 1934, the Treasury Department permitted manufacturers to decide what their rates should be. If such rates seemed out of line, the Treasury Department had to prove them unreasonable. As a result of the application of this policy, the rates chosen averaged about ten percent per year, and sometimes were even higher.

In 1934 a proposal was made in Congress that the depreciation rates then current be sharply reduced and the time for amortization be lengthened. The purpose was to get more revenue for the government at a time when tax yields were small and government expenditures were growing rapidly. The Treasury suggested as an alternative that it would make a substantial reduction in its rates. Congress agreed to this idea.

Whereupon the Treasury Department issued T.D. 4422, and later on Mimeograph 4170, both of

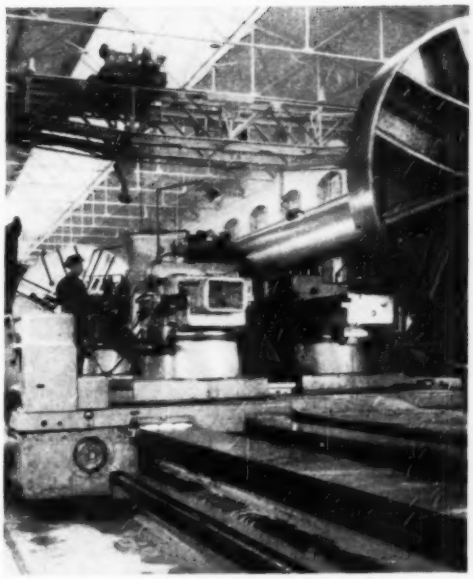
***FRANCE**—Renault has right to depreciate these new presses 15% each year (20% if two shifts) because the government recognizes value of modernization*

which are well known to manufacturers in general. These two orders required the taxpayer to estimate the remaining useful lives of his assets and to set up depreciation rates which would amortize the undepreciated balance over such remaining lives. The burden of proof was placed on the taxpayer to show that the rates which he chose were proper. That in itself was a complete reversal of previous practice.

The Treasury Department later on sent to its field agents a general guide containing experience tables of depreciation rates, classified by specified machines and groups of equipment. These tables were to serve as a starting point from which correct rates might be determined. They were not to be prescribed "for use in any particular case." In practice, however, the tables have had the effect of forcing down the allowable rates.

It is possible, to be sure, for a company to have its equipment written off in a short time if it can present full proof that the useful service life is brief. It may even be depreciated within the span of one year. But these are rare exceptions. And the Treasury Department leans heavily in the direction of low rates.

The average useful life of machines, as determined by Treasury officials, has little relationship to their shop usefulness. Lapping machines and turret lathes, for instance, are to be written off in 21 to 25 years. Hydraulic presses are assigned the same tax life—21 to 25 years. Automatic chucking machines, hobbing machines, honing machines and screw machines are given a 16-to-20-years' tenure for tax purposes. Jigs and dies



***SWEDEN**—Bofors Works may depreciate production machinery on whatever schedule the management sees fit*

***AUSTRALIA**—General Motors can amortize 24% of all production machinery in its new plant at Fishermen's Bend (Melbourne) the first year. Plant is now producing Holden cars designed in Detroit*

A PRACTICAL DEPRECIATION PROGRAM

for America's Metalworking Industries

1

Congress should pass a law directing the Treasury Department to allow manufacturers to take higher write-offs on machine tools and other production equipment in the earlier and more useful years of service rather than in the later and less productive years.

2

Manufacturers should be permitted to write off completely the cost of new production equipment within the service life of that equipment. Obsolescence should be considered as a major factor in determining the service life, instead of the service life being set arbitrarily as a specified number of years.

3

Management should be given freedom, within the scope of sound accounting, of deciding what the depreciation rate for its own equipment should be. After this rate is arrived at, however, management should adhere to it over a period of years.

4

Manufacturers should use depreciation reserves only for replacement of old equipment with new, and not for any other purpose.

are to be written off in five to ten years. The straightline method of depreciation prevails (the same rate holding right through the entire tax life of the machine). No recognition is allowed for higher rates in the first few years of the machine's usefulness and lower rates thereafter.

In clinging to the practice of low depreciation rates on new machine tools and other production equipment, the United States government is showing an indifference to modernization of its industries which is markedly absent elsewhere. Other nations, seeking to stimulate industrialization and to strengthen their economy, have provided inducements in the form of accelerated depreciation.

The classic example is prewar Germany. Hitler wanted to build strong and expanded German industries in the 1930's. Quick depreciation was one of the means which he used to get German manufacturers to modernize and enlarge their factories. Industry was given the right to charge off the cost of new equipment in as short a time as a year or two. This rapid writeoff policy was a prime factor in making Hitler's Germany so powerful industrially. Even at the end of World War II, after five-and-one-half years of devastating war, Germany had more machine tools installed in its metalworking industries than our own country did!

An International Survey

Since the war's termination, the leading industrial nations of the world outside the United States have sweepingly liberalized their machinery depreciation policies. Through McGraw-Hill World News correspondents located in various countries, AMERICAN MACHINIST has secured facts and figures about these policies. They are presented in the following round-up:

UNITED KINGDOM—The net effect of recent changes in Britain's tax laws is to give British manufacturers the right to charge off immediately about 50% of the total cost of new production equipment having an estimated life of 10 years.

Rates which have long applied in Britain provide for a 12½% annual depreciation charge on "precision plants" (including metalworking machinery working to tolerances up to 0.001 in.). That rate is more than double the rate permitted by the United States Treasury Department in this country. It is worked out on the following principle: that 90% of the purchase price of equipment is to be written off over a period of years estimated to be the working life of the equipment; and that the annual percentage of depreciation shall be such that by applying it each year to the net written-down value, 90% depreciation will be achieved in that length of time. The remaining 10% is looked upon as merely scrap value.

As the burden of income tax on British industry grew heavier through the years, some adjustment was granted in the method of arriving each year at that particular year's depreciation. This took the form of an increase in the wear-and-tear allowance which could be charged off.

Instead of refiguring the basic rates of wear and tear, a manufacturer could charge off 11/10ths of the basic rate per year, effective in 1932. This policy was liberalized in 1938 to 6/5ths of the basic rate. A further revision, to 5/4ths of the basic rate, was made in 1945. No change in this rate is provided for in the Finance Bill of 1949.

In addition to the basic rate provisions, the

Finance Bill of 1945 authorized a write-off of 20% of the initial cost of production equipment during the first year, if the equipment was bought after April 6, 1945. In other words, the capital value of the equipment was depreciated by its normal 5 4ths of the basic rate, *plus* 20%.

The Finance Bill of 1949 increases this additional initial-year allowance to 40% of the purchase price. The main effect, as already mentioned is to give new machinery buyers the right to depreciate their new equipment about 50% during the first year. The purpose: to encourage British manufacturers to install new machinery which will lower production costs and, in turn, enable companies to sell goods in a competitive market at lower prices.

Depreciation rates in the United Kingdom, with very few exceptions, have always been on the diminishing-scale principle: that is, the rate is constant and is applied each year to the net written-down value remaining after the previous year's depreciation.

Manufacturers, if they choose, may claim depreciation on a straight-line basis (taking the *same amount* of depreciation every year). But since this method necessitates separate accounting for every item of capital equipment to satisfy authorities that a company is not claiming more wear-and-tear allowance than the 90% of cost-price permitted, no company except those making such big items as ships and aircraft has adopted the straightline policy.

Depreciation allowance in the United Kingdom is under the control of the commissioners of inland revenue. Inland revenue has always been regarded as a matter in which local authorities must have a considerable hand. Because of the influence of local commissioners, various British industries have pressed the tax authorities through the years to set up "agreed-upon rates" of wear and tear which will apply throughout a particular industry. These rates worked out with the central Board of Commissioners of Inland Revenue, are subject to approval of local commissioners in each Inland Revenue Division.

SWEDEN—The land of a Socialist government Sweden, permits its manufacturers to choose the time during which they wish to write off their new production equipment for tax purposes. If it suits them, they may charge off the entire cost immediately. They are not compelled to adhere to the same percentage of write-off year after year. They are given the opportunity to charge different amounts from year to year.

What is more, tax authorities allow manufacturers to place the value on their own equipment and then accept that amount as the basis for tax assessments.

This system has been in force since 1938. The plan in effect the past 11 years was first proposed by organized Swedish industry. The Socialist government accepted it, seeing the advantage of encouraging manufacturers to invest heavily in new equipment in good years.

The generous depreciation policy in Sweden has enabled Swedish industry to re-equip and modernize to an extent undreamed of in many European countries, war or no war. And Swedish labor is fully aware of the advantages it gains.

FRANCE—The aircraft industry, and almost all of France's metalworking industries, including the automobile industry, were put in a special tax category with regard to depreciation rates after the war. These industries have been permitted to take these depreciation rates on machine tools and other production equipment:

15 percent on machines working 2,500 hr. per year (one shift)
20 percent on machines working 4,000 hr. per year (two shifts)
30 percent on machines working 6,000 hr. per year (three shifts)

In addition, specially-designed machines which are intended for a specific job and which normally have a short useful life sometimes are granted depreciation rates of 33 to 75 percent during the first year. Inflation made this liberalization of the fiscal depreciation policy particularly important to French manufacturers.

Basic depreciation rates on plant equipment are the same as they were before the war—10 to 15 percent per year.

INDIA—The government of India allows a depreciation rate of 20% the first year on new or rebuilt machine tools and other production units.

After the first year, the rates are the same as for equipment now in place—10% of the depreciated value annually if the plant is working only a single shift, or 15% if the plant is on a two-shift basis. There are no three-shift operations in India.

By means of these liberal charge-offs, India is offering a bait to her manufacturers to install cost-cutting machinery and to put their factories in first-class physical condition so far as production equipment is concerned.

CANADA—Accelerated depreciation was permitted by the Canadian government in the postwar period from 1945 to 1949. The rate at which new production machinery could be written off for tax purposes was approximately double the

SENATOR GEORGE
ENDORSES ACCELERATED DEPRECIATION

"We've got to keep our production machinery new and up to maximum efficiency. If we permit accelerated depreciation so as to replace equipment in 10 years, we will make a forward step helpful not only in maintaining production, but also in keeping our national defense in clean shape in case of emergency. I highly endorse the proposal of accelerated depreciation. It is something we will do as soon as we can."

Senator Walter F. George
Chairman Finance Committee
United States Senate

PRESIDENT ROOSEVELT
ADVOCATED SPEEDIER WRITE-OFFS

"Business, large and small, must be encouraged by the government to expand their plants and to replace their obsolete or worn-out equipment with new equipment. And to that end, the rate of depreciation on these new plants and facilities for tax purposes should be accelerated. That means more jobs for the worker, increased profits for the business man, and lower costs to the consumer."

Campaign address of Franklin Delano Roosevelt in Chicago, October 28, 1944

normal rate. The normal rate varied with what the government judged to be the normal life of the equipment.

Quick write-offs were permitted to stimulate conversion of Canadian industry from wartime activities to peacetime functions and to speed expansion of non-war industries, thereby providing additional employment.

During the five years in which accelerated depreciation was in force, it was applied to 8,054 projects involving a total capital investment of $1,392,282,000.

Though special depreciation rates no longer are available in Canada, the permanent depreciation policy is currently being revised and a new system put into effect for the current tax year. The new regulations will let the taxpayer practically write his own ticket as to the rate of depreciation to be taken on certain types of equipment. The taxpayer, however, will be subject to a recapture clause, which calls for recapture by the government of any excess realized on the disposal of an asset over its depreciated value.

The recapture principle will require the creation of a depreciation reserve in which sums proportionate to the annual depreciation allowance are placed. If an asset is written down to $100 and, on replacement, is sold for $500, the manufacturer must take $400 out of his depreciation reserve and put it into taxable profits.

AUSTRALIA—As a special inducement to assist its industries in reconstruction after the war, the Australian government made an initial depreciation allowance of 20% on production equipment purchased over the five-year period from July 1, 1946, to June 30, 1951.

The initial allowance is an addition to the regular depreciation rates, which are calculated on the remaining 80% of the cost. In effect, 24% depreciation is permitted during the first year and 4% each year thereafter.

Manufacturers have a choice of basing machinery depreciation on a percentage of the original purchase price or on the diminishing cost principle. But once the taxpayer has selected his method, he must stick to it.

No more than the original cost of a machine may be written off. When the machine is scrapped, the difference between the selling price and the depreciated value if positive must be added to the manufacturer's income for the year in which it is sold. If negative, it may be deducted from the company's income for that year.

In Summary:

Despite the overwhelming evidence that other countries find it profitable and desirable to allow high depreciation rates or to give manufacturers the privilege of selecting their own rates, the United States Treasury Department refuses to budge from its low-rate policy which has been in force for 15 years. The same old outmoded experience table of estimated useful life is the Internal Revenue Bureau's Bible. The period suggested by the Treasury Department as a guide for its agents is 20.74 years for machine tools!

The Treasury Department has the power to liberalize its policies. But it steadfastly refuses. Only one recourse is left then: Congress should pass a law authorizing and directing the Treasury Department to allow manufacturers to take higher write-offs on machine tools and other production equipment in the earlier and more useful years of service than in the later and less productive years.

Management, in fact, should be permitted to decide what the depreciation rates should be on its own equipment. Federal tax authorities should give more consideration to obsolescence and less to theoretical "useful service life" in determining depreciation rates. Of equal importance with these other factors, manufacturers should use depreciation reserves only for replacement of old equipment, not for any other purpose.

How to Choose and Use
PORTABLE TOOLS

PART 9 . . . MAINTENANCE PROGRAM

A properly integrated maintenance program requires careful coordination of several different phases, but pays dividends in continued output

BY H. P. BAILEY, President, THE ROTOR TOOL CO.

ONCE the portable-tool installation is carefully engineered, provision must be made for a complete maintenance program. The objective of this is not merely to keep the tools running but to maintain production output at high efficiency. While factory executives recognize the subtsantial cost of an efficient installation operating at high efficiency, and therefore recognize the importance of a proper maintenance program, unfortunately this program is often inadequate, leading to costly failures and high operating costs. Perhaps the main reason for this is that the maintenance program usually involves a number of people, requires periodic attention, and the pressing duties of day-to-day operations result in neglect.

A well-planned program will cover a number of points:

(1) The starting point is a definite assignment of responsibility for each element of the maintenance program, covering power supply units, power distribution lines and portable tools.

(2) Actual execution of the program should be on a definite periodic or calendar basis to insure adequate preventive maintenance.

(3) Proper equipment for the program must be provided in the maintenance function so that checking, repairing and testing of equipment is easy, on a thorough basis, and of course, adequate supplies of maintenance material such as oil and repair parts must be available at all times.

(4) Cooperation between the man in over-all charge of maintenance, his subordinates in charge of parts of the program, and men actually executing the program is necessary to control the program and to apply good judgment from the expense angle on what ought to be done, and to insure utilizing the abilities of the individual men to the full.

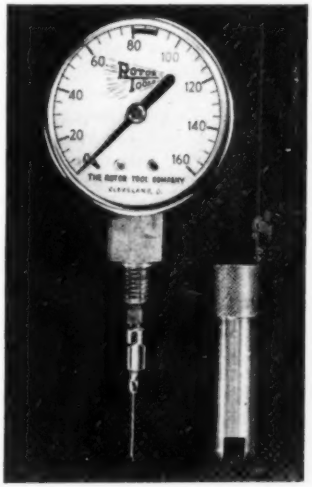
(5) Detailed maintenance help should be given the maintenance man, particularly in case of repairing tools—setting up correct procedures and giving him the information to do his job.

Assignment of Responsibility

Over-all responsibility for the maintenance program is usually assigned to a general executive who, in turn, holds different subordinates responsible for various parts of it. For example, the engineer in the powerhouse may be responsible for compressor operation, the general maintenance crew for power distribution lines, and the repair department responsible for the tools themselves. Exact responsibilities for each group should therefore be determined, with perhaps regular report periods defined. At this point the program is often weak. The repairman may be doing an adequate job of repairing in the case of air tools, but the operators are complaining about the power of the tools. Meanwhile, the men responsible for power distribution may be failing to do their job in providing adequate air pressures, perhaps new hose of smaller size has been provided, and the responsibility is not clearly centered. This type of situation is not at all uncommon.

Starting the Program

In initiating a program of this sort, many firms find it profitable to start with a checkup of the entire system. In the case of an air installation, the man responsible for compressor operation will check and review the condition of the compressor installation. Is the regulator on the compressor operating satisfactorily? Is the air gage at the compressor accurate? Is the compressor location clean, well



Hypodermic needle gage can be inserted into hose close to the tool to indicate actual delivered air pressure under load

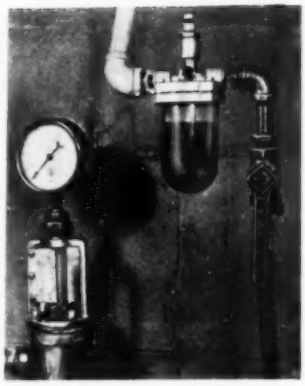
lighted, easy to service? Does the compressor have an effective inlet filter? Is the compressor provided with intercoolers and aftercoolers to reduce water in the lines? Is piping connected to the compressor with flange fittings and all overhead piping well supported? A well-organized compressor room is the starting place for proper compressor maintenance. It is not the purpose of this article to go deeply into details of this subject, but the initial checkup should well examine the situation.

Similarly, the man responsible for the air distribution system may start by determining what the delivered air pressure is to the portable tools at the inlet of the tool while it is under load. If the pressure is below 75 or 80 psi, efficient performance is uncertain and the entire system may need modification, working back through the hose and distribution lines to the compressor itself. Does the man responsible for air distribution have proper testing equipment for checking air pressures in the hose while the tool is running? Are traps inserted in the line to remove condensed moisture at frequent intervals? If the traps are automatic, are they working? If they are not automatic, is there any regular provision for emptying them?

The man responsible for maintenance of the tools themselves may check over existing equipment to see that the setup is not burdened with tools really beyond repair or entirely inadequate for their jobs. He may check to see if men are waiting for tools to be issued, showing that there are not enough tools of one size or type for the work to be done. He may check over the equipment in his own tool-repair room, as discussed later in this article.

High-Cycle Checking

The same procedure may be followed in the case of high-cycle power-supply units which are usually controlled by the chief electrician. Is the location in a clean place, accessible for maintenance or checking voltage? Is the voltage meter O.K.? Is the fuse installation correct? Are there any safety aspects of the installation



Lubricators installed in the line, close to the air hose, insure positive oil supply to air tools

which are wrong? Are lamps installed to show any single phasing that may occur in the system?

In the case of high-cycle installations, questions arise such as: What is the voltage delivered to the tools while operating under full load? How much variation, above and below 220 v is there at various times during the day? Is the fuse system at the point of operation correct to protect the high-cycle tools? Is the cable in good condition to prevent shorts from the plug to the tool and are all tools grounded on the fourth wire?

Similarly, the man responsible for high-cycle tool maintenance will follow the same procedure as in the case of air tools. A complete initial checkup when responsibility is definitely assigned will often reveal conditions which have been obscured, and will start off the entire maintenance program in good shape.

Preventive Maintenance

Experience with users of portable tools shows that nothing will relieve difficulties and insure satisfactory maintenance like the idea of a regular, periodic, calendar checkup. The regularity of such a program detects weaknesses promptly, so production time is not lost and so weaknesses do not develop into serious troubles. Such a program suggests a checkup of the power-supply units and power distribution lines on a given day in the month. This checkup may well be outlined in the form of questions, never overlooking the importance of a definite report monthly on the power supply delivered to the tool in operation, whether air, universal electric or high-cycle. Unless the idea of a periodic checkup is followed, the entire system is often allowed to run under the pressure of day-to-day events until a breakdown occurs. While this breakdown is being repaired, another sometimes occurs. However, more important than this, a gradual deterioration in productive output from the tools often develops and is not checked until it becomes serious. Moreover, firms following the preventive maintenance idea do not find it necessary to keep a large stock of reserve tools to take care of periodic breakdowns.

Check Card System

As a part of the preventive maintenance program, large companies often have complete card systems on the tools, showing when the tools were in, what repairs were done and when they should be checked again. This enables them to spot tools which are weak from the maintenance angle and to keep track of the maintenance costs. Some firms require portable tools to be turned in to the repair shop periodically for checkup, because tools which are allowed to run without definite attention inevitably drop below the point of efficient operation long before they are checked.

In this periodic checkup program particular attention should be given to lubrication on a planned basis. The very life of any portable tool depends on its care and lubrication, and lack of lubrication is the chief cause of wear and consequent loss of power. With air tools, many types have an oil reservoir which should be filled once or twice a day with a type of oil recommended by the manufacturer. Tools not provided with a reservoir, such as small-wheel grinders, should have an oiler in the air line. The use of oilers attached right on the air line near the tool is a great help in prolonging the life and keeping up the efficiency of small-wheel grinders.

These oilers may also be used with larger portable tools and should be located in a position in which the maintenance man can make a periodic checkup and keep them filled with the proper oil.

Use the Right Oil

As oil is so important for portable tools, the question arises, "What oil?" Manufacturers recommend specific oils, and in many cases sell it to the users to help provide proper lubrication. Such a setup is, of course, ideal; and certainly some oil, whether the correct type or not, is much better than no oil at all. Fortunately, in the case of portable tools, oil recommendations are not too stringent, but it should be known that a straight mineral oil is seldom satisfactory. Wherever even a small amount of moisture is prevalent, the use of oils which will properly emulsify in the presence of water is very helpful.

In the case of high-cycle tools, it is important to provide the correct grease in the front handle for the gears and also to provide the exact amount of grease. Too little fails to do the job; too much churns and causes the front end of the tool to heat up dangerously.

The adoption of a periodic checkup for preventive maintenance will keep the tools running at full efficiency rather than just keeping them running. The use of a pneumatic tool averages $2 per hr. Failure to catch a drop in production output is expensive. As tools drop to 80% efficiency, 20% of the $2 an hr is lost. The difference in cost between keeping the tool at 100% and 80% is very small indeed compared to the losses sustained, and is largely a matter of periodic attention.

Maintenance Equipment

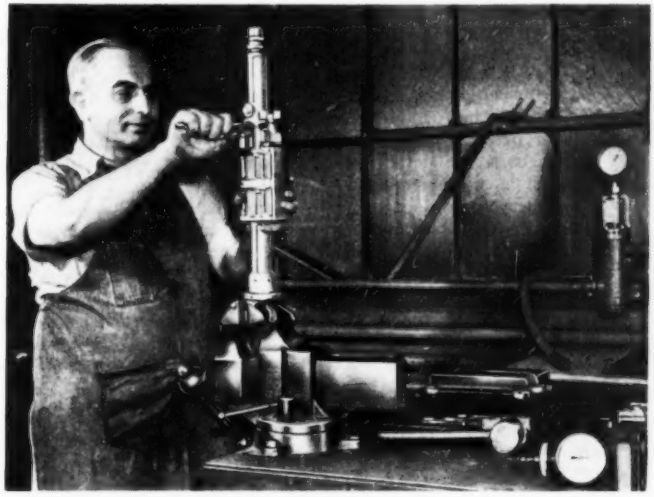
Machining operations in a metalworking plant are nearly always equipped with the best tools and equipment, and the contrast experienced in examining the maintenance room is often rather shocking. The maintenance man repairing portable tools, for example, is often expected to do his job on a dirty bench in a corner of the shop with the barest of necessities. On the other hand, maintenance labor, like all other forms of labor, costs money, and the quality of the job is important.

It is, of course, not necessary to go to extremes, but a reasonable program includes the necessary benches, vises, etc., a supply of power either universal, air, 180- or 360-cycle, provisions for holding the tool while checking, accurate tachometers for free speeds because of the safety angle, and the necessary tools for dismantling and assembling the machines themselves. In many cases, particularly where a number of tools of a given type are in use, special wrenches and devices which will cut down the time of assembly and dismantling are worth while.

Charts should be posted showing the proper speeds for each tool as issued to the shop, and these speeds should be checked religiously by the maintenance man from the safety angle. Some of the larger shops provide prony brakes to test the power of the repaired machine, but an experienced man can check the power of a repaired machine quite satisfactorily by applying a grinding wheel or a drill, etc., without the complications involved with the prony brakes. The repair shop should also have, in bound form, the maintenance helps and sheets furnished by the manufacturers of the different tools, although these are usually found somewhere in the general office instead of in the repair shop. These maintenance bulletins supply time-saving information on assembly and disassembly, and usually specify the type of lubricants to be used.

Detailed instructions of the manufacturers go somewhat further and discuss proper limits for wearing of blades, for example, in rotary tools, and emphasize the fact that it is cheaper to replace bearings than let the machines go and break down. These helps also show how to cut the repair cost, indicating where end plates may be reversed, for example, instead of buying new end plates, how to adjust governors for the safety limits, and so on. The maintenance room should also have an adequate stock of repair parts and the maintenance man himself should be experienced, trained in his job, and alert to the possibilities of his position, since his ability to repair tools properly and maintain them at their maximum efficiency will, in turn, influence directly the productive output of a substantial number of workers in the shop.

(The 5th and concluding part of this series will appear in a forthcoming issue. Ed.)

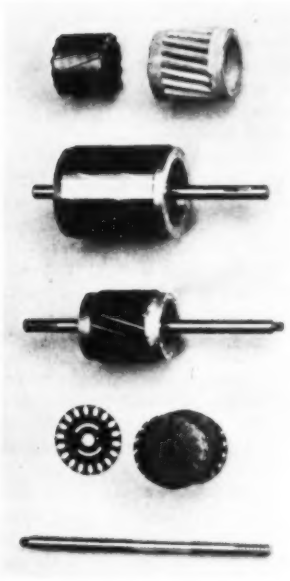


Maintenance men should be provided with all necessary equipment and manufacturer's instruction books

MOTOR ROTORS CAN BE DIE-CAST

With steel laminations and shafts as inserts, clusters of four rotors for fractional-horsepower motors are die-cast with less labor, less time, and fewer rejects than for copper-bar rotors

Four die-cast rotors as they are produced in one shot with steel laminations and rotor shafts as inserts



Two sizes of cast rotors are shown at center. At top are one of the old copper-bar rotors and a new rotor from which the laminations have been eaten away to show the casting alone. At bottom is a stack of laminations, a single lamination, and a rotor shaft

ROTORS for fractional horsepower motors are now being successfully die-cast of aluminum. The result is a rotor that is superior to the copper-bar rotor and costs considerably less.

These motors, made by Victor Electric Products, Inc., are used in fans, ironers, and other appliances. The largest rotor is for a one-sixth horsepower motor and, when die-cast, weighs 3¼ lb.

The former method was to count or weigh the steel laminations, stack them properly, and insert the copper bars. Collector rings were pressed on each end and each bar was soldered or welded to the collector rings. This assembly procedure was tedious and rejects were common. All of the rotors had to be balanced after assembly.

For die casting, the laminations are weighed and stacked on the rotor shaft. Slots for rotor bars are oblique to the axis of the rotor to provide necessary starting characteristics. These assembled units serve as inserts for the four-cavity dies used in casting.

Four-cavity dies are used for all the different rotors which are produced. However, the dies are made with inserts which can be changed to suit varied heights of the stack of laminations. In this way it is only necessary to change dies when there are variations in diameter. Three different dies take care of the eleven sizes produced.

The laminations must be tightly clamped together to prevent aluminum from being forced between the laminations. This would cause rejection of the rotors. The die is designed to accommodate slight variations in the height of the stack, but it is important to keep the stack as uniform as possible to prevent rejects.

Two Model 400 Cleveland die-casting machines are employed. This is a toggle-type machine with a hydraulic system that can deliver oil at 2000 psi to the shot cylinder. Die halves are held together with 400 tons locking pressure. Compressed nitrogen from the accumulator bottle forces the aluminum at 350 fpm into the die cavities. When the metal meets resistance, the high-pressure stage of the pump cuts in to provide squeeze pressures up to 10,120 psi.

Aluminum for the rotors must be as nearly pure as possible. The

Foreman of the rotor department inspects a gate of castings as he removes them from the machine. In foreground are assembled inserts ready for casting

aluminum used by Victor Electric Products is 99.5% pure and has an electrical conductivity of 64. This aluminum is sticky and does not cast as easily as other aluminum alloys, but by using a satisfactory die lubricant this difficulty can be largely overcome. The molten aluminum is held at 1375 F in an electric furnace.

Collector rings at each end are cast integral with the rotor bars. Numbers or other identification can be included in the casting. The operator removes the gate and runners from the castings and returns them to the melting furnace.

An average production of 50 to 55 shots per hour can be made with the 4-cavity die, giving an hourly production of 200 to 220 rotors from each machine. Rejects run less than 1% and are usually due to reasons other than die casting.

In addition, only about 25% of the die-cast rotors require balancing whereas nearly all of the copper-bar rotors had to be balanced.

There is no reason why this method could not be applied to larger rotors than the 3¼-lb, sixth-horsepower rotor which is the largest sized required by this firm. However, larger sizes would require single- or double-cavity dies.

Tips FOR TOP SHOP MEN

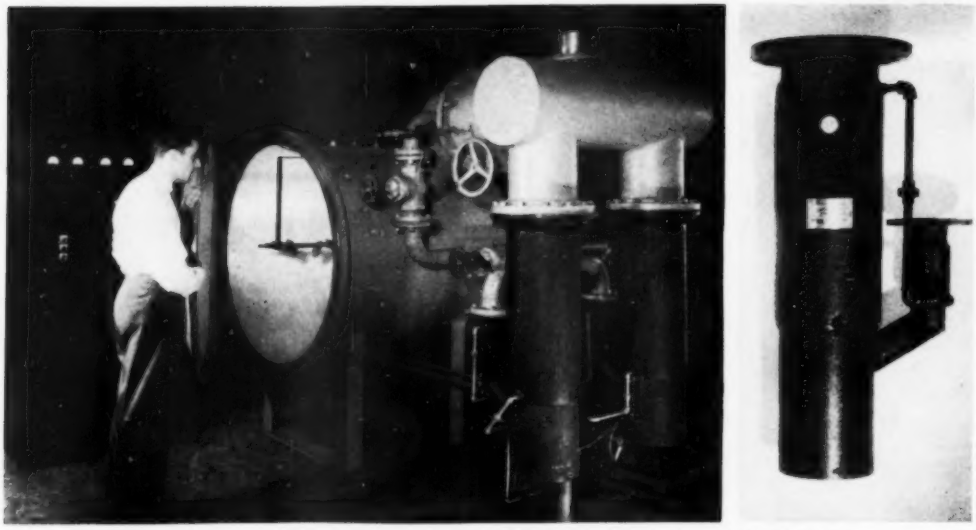
299 You have no real right to the title "Boss" until you've trained subordinates to shoulder most of your responsibilities—and learned further to give them credit for what they do.

300 The more arguments you win, the fewer friends you have. You can be *the* right guy or *a* right guy, just as you choose.

301 Men are like steel—when they lose their tempers they're useless. Remember to keep your own usefulness.

302 A soft answer turneth away wrath—and a sharp answer turneth away business.

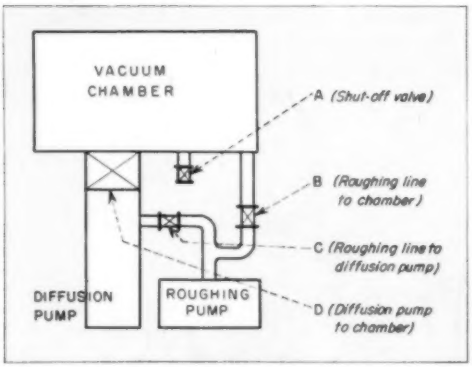
"What, lunching again, Miss Smitchful?"



High-vacuum coating system completely assembled with valves, pumps, control panel and evaporating chamber. Oil diffusion pump, right, connects through smaller flange to roughing pump. Larger flange connects to coating chamber, usually through a valve

VAPORIZED METALS COAT SURFACES

Plating aluminum onto glass, zinc onto paper, and silver onto cellophane are among the many applications of the high-vacuum vaporization process

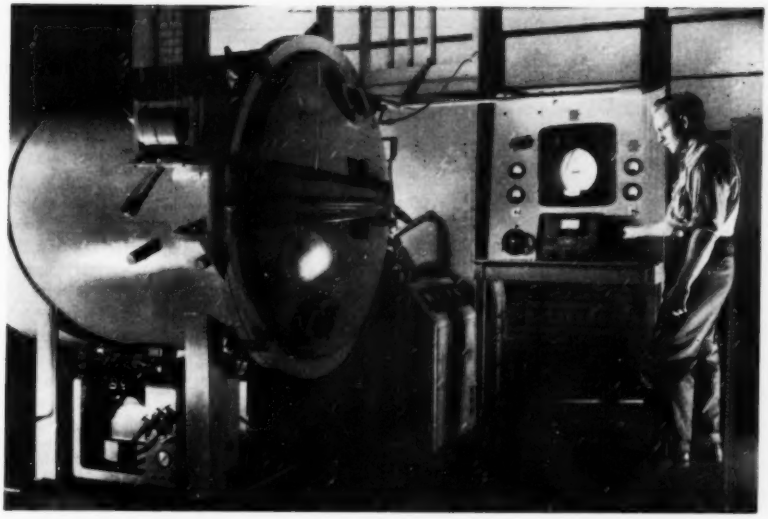


Valve operation sequence for minimum time loss. At end of cycle, A and B are closed, C and D open. To start cycle, close D and C, and open A. Remove work, reload, close A. Open B until system is evacuated to pressure where diffusion pump can be used. Close B, open C, open D

BY JEROME L. BLEIWEIS, Metal Finishing Consultant

BEFORE the war, high-vacuum deposition of metals and metallic derivatives was not much more than a laboratory tool. Some commercial work was in progress, but this was restricted to production of front-surface mirrors, primarily for scientific use and for specialized applications, of which telescopic mirrors for astronomical purposes, and half-wave coatings or partially reflecting coatings for interferometers are examples.

High-vacuum techniques improved rapidly during the war, resulting in the manufacture of high-speed pumps, commercially usable high-vacuum valves, high-boiling-point oils producing stable high vacuum when used in diffusion pumps, and other equipment which has transformed the process into a readily commercial one. Today, applications for metal evaporation in vacuo include, beside the production of front-surface aluminized and other metallically coated mirrors, a number of others, notably the production of gold leaf, paper condensers, mirror-like metallic coatings on continuous rolls



High speed, continuous coating machine for zinc coating electrical condenser paper at a rate of 500 linear ft per min

of plastic sheet, and coating of lenses with metallic salts to reduce lens glare or reflectivity. Conducting films of gold are deposited on record masters, as the initial coat in the production of the final mold, by metal evaporation or its closely related process, sputtering or cathode sputtering.

Principles and methods for the production of thin films by the evaporation method are essentially uncomplicated. Whenever a metal is heated, in vacuo, to a temperature exceeding its boiling point at the existing ambient pressure, the metal will evaporate and discharge out into space until it impinges upon some physical impediment upon which it will condense in a continuous film. If the pressure in the system is not low enough (or conversely, if the vacuum is not high enough) the gaseous metal will collide with air molecules and will deposit as a dark powdery deposit on the surface to be coated. The pressure in the system must be low enough so the mean free path, i.e., the average distance a molecule can travel before colliding with another molecule, is larger than the greatest distance between the generating source of evaporated metal and the most distant point to be coated. The mean free path for air is about 2½ in. at 10^{-3} mm pressure, 25 in. at 10^{-4} mm, and 250 in. at 10^{-5} mm. Therefore, the pressure in the system should generally be at least as low as 10^{-4} mm for most applications. Of course, where the system is larger, the pressure should be lower.

Equipment Required

The equipment required falls into the following general groupings:

1. Closed chamber which will be evacuated and in which the process will take place.
2. Pumps for producing the high vacuum.
3. Source of heat to raise temperature of material being evaporated to the required point.
4. Gages for determining the pressure in the system, the pressure where the diffusion pump will be operative, and the pressure at which evaporation can proceed successfully.
5. High-vacuum valves.

Closed Chamber

The closed system or vacuum container may be a bell-shaped stainless steel tank, plain carbon steel tank nickel plated on the inside, or a glass bell jar. In either case, the tank or jar should have a smooth flanged or unflanged rim lip upon which may be set a rubber (usually synthetic, neoprene-type) gasket. The tank, with the gasket set on the lip, is seated on a flat ground, nickel-plated steel baseplate. All air, pump, and electrical or mechanical outlets are made in the basepate. As air is evacuated from the system the tank is drawn down against the baseplate. The compressed gasket acts as an excellent high-vacuum seat and, if set correctly at the outset, is virtually leakproof. The most effective procedure for preparing the baseplate is:

1. Blanchard grind
2. Bore, drill, and tap required holes
3. Nickel plate (0.001 in. thick min)
4. Satin finish nickel, using stroke so lines run circumferentially.

For larger systems it is possible to construct the tank by welding steel sheet, reinforcing suitably, and setting the gasket on the top rim of the tank, using a tongue and groove arrangement. Welds must be 100% sound for high-vacuum applications. The tank and cover should be completely nickel plated on the inside.

Types of Pumps

Pumps for high-vacuum evaporation are of two types. The so-called roughing pumps are mechanical rotary-type machines for evacuating the system from atmospheric pressure to pressures of

less than a few tenths of a millimeter of mercury (less than a few hundred microns). It is possible to substitute other kinds of pumps as long as the same ultimate pressure is achieved. This is rarely done, but a modern high-speed substitute for large systems could be the steam ejector-type mechanism. The second type of pump is the diffusion pump, connected in series with, and on the high-vacuum side of, the roughing pump. Diffusion pumps will reduce the pressure in the system from less than a few tenths of a millimeter of mercury to the required 10^{-4} mm and lower. They consist essentially of a boiler in which oil or mercury is vaporized, a chimney for directing the vapor, a jet assembly through which the vapor is driven, and cooling coils to condense the vaporized oil at the throat of the pump. The process of vaporization and condensation causes the air to diffuse from the chamber to the low-vacuum side of the diffusion pump where it is compressed and withdrawn by the roughing pump.

Oil or Mercury Used

Diffusion pumps employ either mercury, or oils such as dibutyl phthalate or special proprietary oils as their pumping media. Mercury is rarely used commercially because of the necessity of employing "cold" traps, the slow pumping speeds obtained, and difficulty with materials of construction. Oil pumps, on the other hand, are constructed of aluminum or any other metal; require no traps, because they work with materials having very low vapor pressures; and produce phenomenal speeds, as high as several thousand liters per sec if required. The heater is usually an immersion heater of the familiar Calrod type.

A disadvantage of oils is that slight decomposition occurs at working temperatures and pressures and this is accelerated when air is allowed into the system while the oil is hot. It is therefore necessary to cool the oil before admitting air after each evaporation cycle. This cuts down the productivity of the unit. However, the incorporation of high-vacuum valves obviates the necessity for

USABLE FILAMENT MATERIALS AND EVAPORATION CHARACTERISTICS OF VARIOUS METALS

METAL	FILAMENT	METHOD OF ATTACHING	EVAPORATION CHARACTERISTICS
Cadmium	Tungsten (iron or nickel may be used.)	Electroplating cadmium on filament	Evaporates readily at low temperature. Metal sublimes
Zinc	Tungsten, iron or nickel	Electroplating zinc on filament	Evaporates readily at low temperature
Magnesium	Tungsten	Prefuse in helium atmosphere or use thin wire twisted about filament	Sublimes, yields highly reflective coatings
Bismuth	Nickel	Place in nickel crucible	Evaporates readily from the crucible. Mirror has a reddish tint
Antimony	Nickel	Place in nickel crucible	Evaporates readily and produces a highly reflective mirror with a somewhat grayish cast
Lead	Tungsten or Nickel	Plate, twist, or place in crucible	Coating is produced readily but quickly acquires a grayish tarnished look
Tin	Tungsten	Electroplate metal on filament	Brilliant white coating
Chromium	Tungsten	Prefuse in helium atmosphere or electroplate on filament	Hard, highly reflective coating. Metal sublimes
Silver	Molybdenum	Electroplate or place on strip. Tungsten may be used if the silver is electroplated	High reflectivity. Transparent coatings show beautiful azure blue transmission colors
Gold	Tungsten	Twist wire or plate on filament	Evaporates readily
Aluminum	Tungsten	Twist wire on stranded filament. Carbon crucibles may be used but they fail rapidly due to attack by molten aluminum	Highly reflective non-tarnishing mirrors are readily produced. The adhesion of aluminum on nonmetallics is intrinsically superior to that of most other metals
Copper	Molybdenum	Electroplate or place on strip of molybdenum. Tungsten may be used where copper is attacked by electroplating	Highly reflective coatings produced readily
Iron	Tungsten	Electroplate or twist on filament	Iron reacts with tungsten filaments causing frequent failures. It may be advantageously evaporated via the induction heating method
Nickel	Tungsten	Electroplate or twist on filament	Nickel reacts with tungsten causing frequent filament breakage. Induction heating would be applicable
Platinum	Tungsten	Twist platinum with strands of tungsten	Evaporate slowly to prevent globule formation and consequent loss of metal

cooling the oil or allowing atmospheric air to enter the diffusion pump (see below).

Heating the Metal

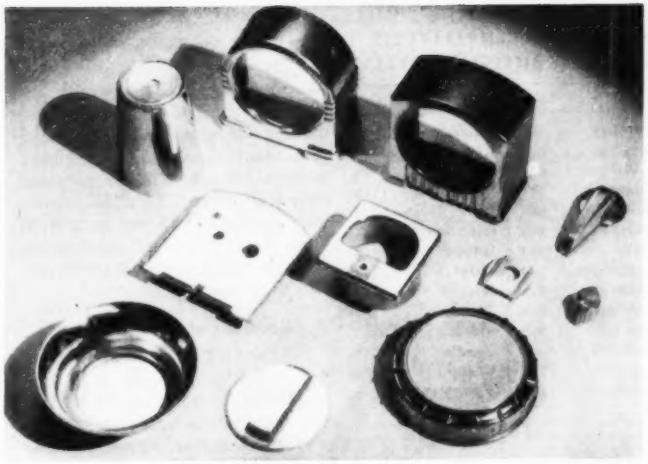
The metal to be evaporated may be raised to its evaporation temperature by attaching it physically to a refractory metal filament which is heated by passage of current through it. Most metals will melt first, wet the filament continuously or in droplets, and finally evaporate. Instead of filaments, crucibles or strips may be employed. It is possible, by coiling or stranding the filament, to produce various adaptable holders for the metal. Induction heating is another practical method for raising the temperature to the evaporation point. Larger quantities of metal can be vaporized using this technique. The refractory metals for heaters are tungsten, molybdenum, tantalum, and for some applications, columbium, nickel, carbon, iron, and platinum.

Types of Gages

Some of the gages common on high-vacuum systems are the absolute McLeod and Knudsen types, and the secondary Pirani, viscosity, or ionization, gages. For metal evaporation the Pirani, with measuring limits at about 10^{-3} mm of mercury, is generally satisfactory. If measurements below this are required, the ionization gage, limited to pressures 10^{-5} to 10^{-9}, may be employed. The gage should be connected into the system through the baseplate and should record pressures close to the areas of production. It is not absolutely necessary to have a recording gage. Qualitative measurements of pressure may be obtained with a high-voltage discharge tube or transformer such as those used across neon lights. The discharge is directed into the system along a wire or post sealed into, but well insulated from, the baseplate. As the system is evacuated, the following phenomena will be observed:

1. At pressures above a few centimeters of mercury no corona is observed in the system.
2. Suddenly a brilliant violet corona bursts forth, illuminating the whole system but concentrated about the discharge wire as its axis.
3. Color changes as the pressure is reduced. It becomes pink, red brown, bluish, and finally a pale bluish green. The corona spreads into and diffuses the whole system and begins to lose its identity with the discharging wire.
4. Finally the corona abruptly disappears. The pressure at which this occurs is about 10^{-4} mm or the usual pressure at which evaporation may be initiated.

The arc discharge has the added quality of "cleaning" up the surface of the material to be coated, by ionization of thin organic surface films or attached layers of air. Its employment will somewhat increase the adhesion of the deposit.



Typical plastic articles which have been metal coated by metal evaporation under high vacuum

High-Vacuum Valves

High-vacuum valves are built into the pumping system so any section may be opened or closed to other sections, or to the atmosphere. They make it unnecessary to cool down the diffusion pump, and prevent the pressure in the diffusion pump from rising to the point at which decomposition of the oil would be likely. Their proper employment aids in increasing productivity and trouble-free operation, as the only limitation on production rates is the time to load and unload, and the intrinsic limitation of the pumps themselves.

Plating Procedure

Component parts of the system are connected and tested for leaks. Pumps are connected to the chamber and to each other by bolting their flanged ends together and using rubber gaskets between the flanges. Electrodes and gages are sealed into the system through the baseplate. The empty system is evacuated to test for leaks. If a pressure of 10^{-4} mm or better is obtained in approximately the period expected from a consideration of the designed speed of the pumps, the system is ready for production. If this is not achieved, the indications are that the system has a leak through which air is entering. A small volume of air coming in at 760-mm atmospheric pressure will expand to almost 10 million times its volume at 10^{-4} mm. Minute leaks, therefore, are sufficient to prevent the attainment of the required high vacuum.

Leaks are detected by systematically probing the walls and joints of the high-vacuum end of the system with a drawn nozzle through which helium is forced under pressure. When the leak is reached, the helium will flow into the system, instead of air, and a sudden jump on the Pirani indi-

EVAPORATION TEMPERATURES (Absolute) OF DIFFERENT METALS*

METAL	TEMP.	METAL	TEMP.
Mercury	320	Lead	1000
Caesium	433	Tin	1148
Rubidium	450	Chromium	1190
Potassium	480	Silver	1319
Cadmium	541	Gold	1445
Sodium	565	Aluminum	1461
Zinc	623	Copper	1542
Magnesium	712	Iron	1694
Strontium	811	Nickel	1717
Lithium	821	Platinum	2332
Calcium	878	Molybdenum	2755
Barium	905	Carbon	2795
Bismuth	913	Tungsten	3505

* *Procedures in Experimental Physics by John Strong. Published by Prentice-Hall, Inc., New York, 1938.*

cator will give notice of the leak.

Carbon dioxide or acetone probes are also employed, with the arc discharge as an indicator. When either of these enter the system, the corona abruptly changes its color because of the ionization of a substance having its own typical arc discharge characteristics. Alternatively, water may be painted on the walls of the system with a brush. When the leak is covered with water, the system will be temporarily sealed, as will be evidenced by the changing gage reactions. When the leak is detected, it should be suitably sealed by welding, soldering, resetting gaskets, sealing with hard vacuum wax, or some other method.

The work to be metallized is suitably cleaned, mechanically, by solvents, chemically, or for some applications, not at all. It is placed in the chamber on suitable racks and the system is evacuated. If difficulty is experienced in evacuating the apparently leak-free system, it is probably due to the slow evolution of air trapped in folds or recesses of the work, to high vapor pressure materials, or to the phenomenon called outgassing. Outgassing results from the slow evolution of absorbed or adsorbed gases or vapors on the surfaces of the work. It may be overcome by pumping long enough until the pumping speed exceeds the decreasing outgassing rate, or by employing larger diffusion pumps.

When a pressure of 10^{-4} mm of mercury or better is reached, the filament, upon which the metal to be evaporated is physically attached, is electrically heated. The metal evaporates until the required thickness is deposited, and the heat is then cut off. The evaporation time for opaque films of aluminum may take from 15 sec to 2 min. Once the metal fuses and reaches its evaporation temperature, it distills very rapidly.

Applications of the Process

The most evident application for metal evaporation is in the production of front surface mirrors or transparent coatings. Front surface aluminum mirrors are used on astronomical telescopes, in projection type television receivers, and for scientific equipment where a special reflectivity characteristic of the evaporated metal is required. There are a number of novelty uses, particularly for silver, where continuous rolls of cellophane or cellulose acetate are coated with silver followed by clear or aniline dye lacquers for the production of tinsels, spangles, and highly reflective metallized plastic ornaments.

Transparent coatings are utilized in optical instruments such as interferometers, or in some color cameras. A novelty recently introduced involved coating sunglasses with a partially reflecting chromium coating.

Recently a method was developed for the production of gold leaf and other foils by evaporating and stripping the films. Paper condensers may be produced by coating the rolls of paper with aluminum or zinc. Metallic connections may be made to quartz crystals by evaporating a metallic coating on the quartz and subsequently plating and soldering to the metal. This procedure is applicable to a host of non-metallic materials of which record masters are typical. Record masters are sputtered or evaporated with gold, and heavily plated. The coating is then stripped from the master to produce the primary mold.

Various salts have been evaporated to produce cathode ray tube screens or photoelectric cell elements. Selenium plates for rectifiers are being produced by the evaporation of selenium. Transparent coatings such as magnesium fluoride, one quarter of a wave length thick, are applied to lenses to reduce glare. The fluoride is evaporated until a magenta color is observed on the lens, indicating that the desired thickness of coating has been attained.

Production of low-temperature-coefficient resistors and inductances with low space factors are commercial possibilities along with many others which will develop as more phenomena are discovered and ingenious applications are made in this relatively new commercial field.

"OK, so I am doing it wrong! Show me how to do it right."

ROUND TABLE

Excuse Me, Please

"So now we got to mind our manners, too, Al! Who'd have believed a few years back that we'd be getting a lecture on 'Courtesy Has A Place In The Shop'? Reminds me of dancing school—and I'm running a shop with a schedule. There's no time for applesauce."

"It's not as bad as that, Ed, and you know it. All they expect you to do is to show the boys you're a human being, not a machine."

"But machines don't get mad and almost always do as expected. Humans are sure different from that. Besides, the men know what I'm like—that I'm straight from the shoulder. I start acting like a bank clerk and the boys'll think I've gone soft. Then watch things slump."

"Look, Ed, you can be firm—and still courteous. Nobody could ever think of you as a rabbit! Would be more like a leopard trying to change his spots."

"I still say the boys expect a boss to be tough. They got to have somebody to be sore when a job is going wrong, or when they get up on the wrong side of the bed. If I'm all sweetness and light, who are they gonna growl about."

"You mean you're tough just so they have somebody to be sore at? Come off it, Ed! You're tough because you think you've got to be—and because you're a little spoiled. When you get up on the wrong side of the bed, you work it off on the boys."

"Like the devil I do! It's just that some mornings I have to throw my weight around to get things going on the right track. There's no point in coddling the boys—if you're civil to some of these guys they'll walk all over you."

"You mean, Ed, that if somebody is civil to you, you take the chance to walk all over him? You remember Jim Corbett, the heavyweight champ? They called him Gentleman Jim because he was so mannerly outside the ring. He said he could afford to be a gentleman because everybody knew he wasn't scared."

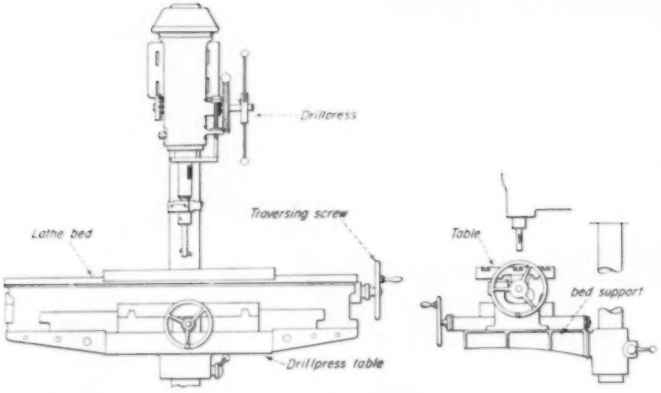
"I'm a gent, too, Al, outside the ring. But when I'm in the shop I'm workin' at my job, just like Corbett did. And he never said 'Pardon me!' just before he flattened Bob Fitzsimmons. In the ring, he was workin' at his job."

"You're just being old-fashioned. The idea of being hard-boiled is out these days."

"Maybe that's the trouble. A little more hard-boiled attitude might tone some of these wise guys down to where they'd do a day's work again."

DOES COURTESY SUGGEST TIMIDITY? *If a foreman or other executive is reasonable, will his men take advantage of him? Your ideas or opinions on this subject will interest others. Discussions of earlier topics appear on later pages.*

Practical Ideas



Drillpress and Bench Lathe Combined into Jig Borer

JIG BORERS or vertical mills are out of the offering-price range of most small shops, yet these machine tools are valuable in any shop, regardless of size. A simple jig borer can be built from a good drillpress and an old bench lathe, and although the home-built affair will not have the accuracy or ruggedness of a new machine, it will prove a valuable addition to a shop.

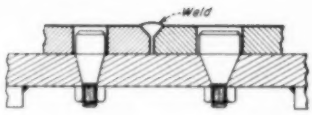
The reworking method consists of mounting a cross-slide on the drillpress table; then mounting the lathe bed on top of the slide. A new table is made from cast iron or steel to ride on the ways of the lathe bed.

Actual parts available for the job would vary from shop to shop, and in many places suitable slides and tables could be reclaimed from old broken-down machines. However, a slide—either made or salvaged—is fitted with a handwheel and screw for crossfeed. The bottom of the slide is machined to lie flat on the drillpress table, and is bolted down. Frequent checks with a level and with a dial indicator on the drill spindle—like at this point in the assembly—will insure fair accuracy of the mating parts.

The casting of the lathe bed is then reworked to mate with the cross ways on the slide, and also so the feet will rest on welded-up supports that are either bolted or fixed permanently to each side of the drillpress table. The bed will slide in and out on these supports, so they must be flat and level. The feet will have to be planed or milled off to form good sliding surfaces.

On top of the lathe-bed ways, which should be reworked for accuracy, a new table is mounted This can be machined to fit two of the bed ways; and is also fitted to the leadscrew from the old lathe that is fitted with a traversing handwheel. Conventional T-slots can be cut in the table surface.

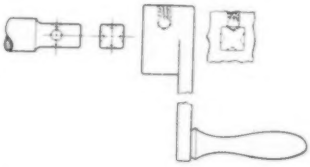
Suitable lubricated bearings must be fitted to the crossfeed and traversing screws, and all moving ways must be lubricated. Drive is taken from the drillpress motor, and is transmitted through pulleys and belts to the drive gear at the drillpress handwheel. After assembly, the table can be trued with the spindle with a dial indicator. If the slide is not permanently fixed to the drill table, the mechanism can be removed so the press can be utilized for normal drilling. *Lowell F. Stull, Youngstown, Ohio.*



Tapered Locating Pins Shift To Release Welded Assemblies

PARTS to be welded together must often be located in fixtures from previously machined holes by means of pins. After tacking or final welding the assembly may be distorted so that it is difficult to remove from the fixture. We get around this problem by designing fixtures with tapered pins fitting in tapered holes.

Accurate location is assured by nuts which are tightened on the threaded ends of the pins. After welding, the nuts are slacked off so the pins can be raised. Then they can be shifted to release the assembly. In cases where only rough location is required, the threading and the nuts can be omitted. *H. G. Frommer, Milwaukee, Wis.*



Notches Hold Vise Handle

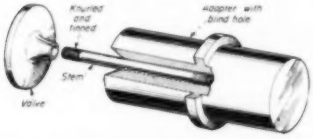
FOUR SPOTS made with an ordinary drill point on the flat surfaces of the end of a screw or vise spindle simplify the problem of the handle falling off because of machine vibration.

A hole drilled in the vise lever doesn't quite go through, which leaves enough lip at the inside end of the hole to retain the small ball and spring in place, even when the handle is removed from the screw. The end of the spring hole is peened over to lock the screw and ball in place. *R. A. Lachmann, Chicago, Ill.*

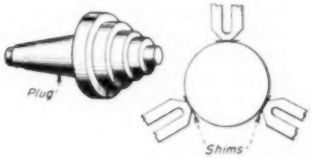
Turret Fixture Assembles Stem to Valve

To CUT down scrap caused by operators assembling valves and stems by eye, we added a simple fixture to the tools in a W&S turret lathe and included the assembly in the machine cycle that drilled the cast Waukesha-metal valve. This saved us time and handling, and eliminated scrap caused by misalignment.

The stem is 430F stainless, and is knurled and tinned on the end



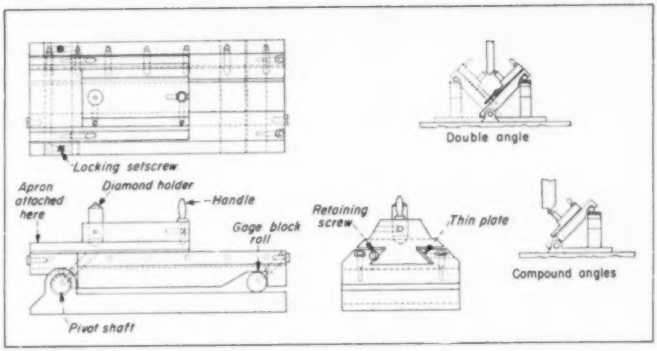
that goes into the valve. The collar-like fixture was fitted into one of the turret holes, and after the valve had been machined, the stem was inserted in the collar and transferred to the valve. *Theodore A. Nienast, Beloit, Wis.*



Stepped Plug and Shims Help Pre-Set Steadyrest Jaws

HERE IS our method of setting up steadyrests for various diameters. The setup plug is turned down on one end to fit the taper in the spindle, and the other end is turned to steps, like a cone pulley, to the most commonly handled diameters.

These diameters are purposely turned 0.004 in. undersize, and when the plug is placed in the rest, the jaws are set on 0.002-in. shims. Diameters other than those turned on the steps are set by placing the next smaller diameter of the plug in the rest and shimming up to the jaws with three shims of the same thickness. Then, after the jaws are centered, the plug and shims are removed and the work is set up. *Ray Cafiero, Brooklyn, N.Y.*

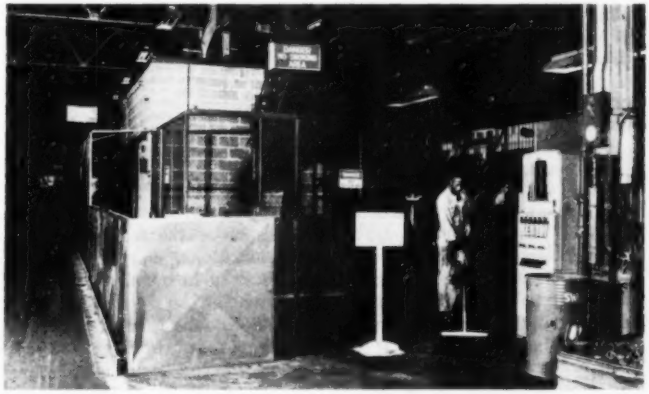


Shop-Built Angle Dresser Features Dovetailed Slide

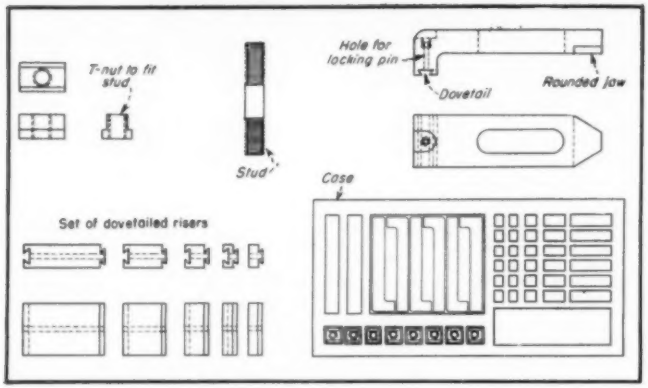
TOOLROOM WORK requires a good angle dresser, and if more features can be incorporated in one design, it can be employed for more jobs. This dresser has dovetail construction so the slide that carries the standard diamond holder can be reciprocated for quite a distance.

Two screws are assembled into the adjustable plate that carries the slide to prevent excessive motion. A flat plate can be bolted to one end of the slide to act as an apron to keep dust from the wheel out of the slide. Setscrews are provided at each end of the pivot shaft so the adjustable plate can be locked after gage blocks have been set under the roll at the other end for precise angles. After wear, the roll can be replaced by removing two long screws.

The fixture is exactly 5 in. between the center of the shaft and the center of the roll, so gage blocks can be easily chosen for particular angles. A thin plate or gib adjustment plate is added to the dovetail so pressure caused by a gib screw can be varied to control the tightness of the slide. Two holes are provided for the handle, which is held by a long setscrew, so the handle can be moved, if necessary, to clear obstructions. *Allan B. Nixon, Springfield, Mass.*



TWO "Danger—No Smoking Area" blinker signs near roof level point out areas where explosive fumes are present. These are more effective than conventional painted signs. *Ford Motor Co., Detroit.*



Set of Riser Clamps Simplifies Milling Setups

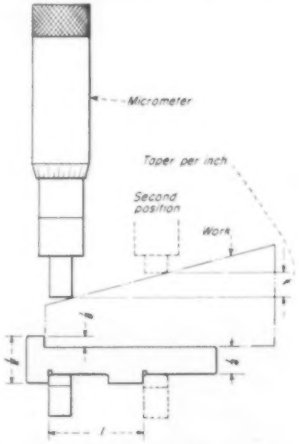
A SET of six of these clamping tools was made up for two milling machines in our shop. Although such clamps are common enough, these have a few features that may be worth duplicating in many shops.

The clamp itself is a slotted type with an elbow bend at one end. This is dovetailed to accommodate any one of the five different riser blocks, which are also dovetailed. All risers except the smallest one are dovetailed on their bottom surfaces so they can be set up in combinations for high work.

Each clamp is fitted with a locking pin that is made from a socket-head setscrew. A screw is drilled at the non-socket end and the pin is hardened and drawn and sweated into the screw with solder. The assembly is screwed into the clamp so the pin will hold the riser blocks in place. This method of alignment allows non-vertical setups, as on lathe faceplates.

The jaw faces of the clamps are rounded at a fairly large radius so the clamps will be self-aligning on rough work. T-nuts, studs, and wingnuts or plain nuts are made to fit the set. All dimensions, of course, are proportioned to fit the range of work the clamps are expected to hold.

In order to keep the set all in one place so it will not be broken up or parts will not be lost, a wooden case is made to fit all parts. All parts are made with a fair amount of precision, so they are worth keeping in the case. *Allan B. Nixon, Springfield, Mass.*

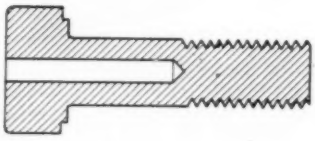


Taper Adapter Holds Part and Micrometer for Measurements

CHECKING TAPERS on large work offers no more trouble than any measuring job, but small stuff is difficult to hold and gage with a micrometer.

This adapter provides two advantages for measuring small parts. First, its end stop holds a part steady and in one position so a second measuring of the part can be made at the same place. Second, the two projections underneath the block locate the anvil of the micrometer in two positions that are exactly 1 in. apart.

The adapter is ground smooth and accurate, with special attention given to the spacing of the projections. Parts are checked by placing a micrometer in the two positions shown, then subtracting the readings to find the taper per inch. This adapter should only be employed for small tapers, since measurement is not at right angles to the axis of the part but is at a slight angle. However, on small tapers this difference will not be enough to affect accuracy. *Stanley R. Welling, Racine, Wis.*



End-Drilled Capscrews Resist Shock Loads Better

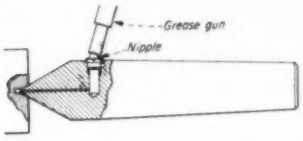
THIS METHOD of modifying standard capscrews has added materially to their life in actual trial tests, and has been adopted as standard practice in my department where the capscrews are subjected to shock loads.

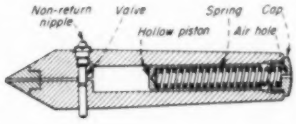
The actual strength of a capscrew is determined, not by the area of the unthreaded section, but by the area of the thread root. If a hole is drilled into the head of a screw and down to the threaded section, the area all along the screw will be the same. This will equalize the deformation under shock load, and will make the screw better able to resist the shocks.

Exact diameters for drill sizes can be found by taking the square root of the quantity: diameter of the unthreaded section squared minus diameter of the root squared, or:

$$\text{Drill dia} = \sqrt{OD^2 - RD^2}$$

A table with values for common capscrew sizes and corresponding drill sizes can be made up and posted. *Ray Cafiero, Brooklyn, N.Y.*



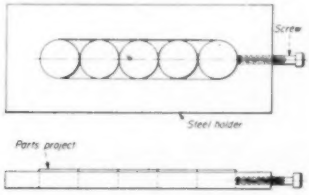


Grease Lubricates Dead Tailstock Centers

TO EXTEND the life of lathe centers, good lubrication is necessary. This can be done with the aid of a nipple and a grease gun as in the top illustration.

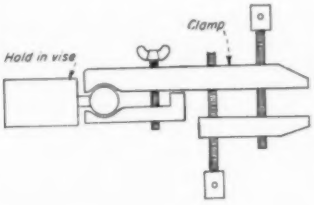
To save lubricating time, there is a more efficient method. The shank of the dead center is hollow, which forms a container for a large charge of grease. The lubricant is filled into the container through the nipple with a grease gun. This compresses the piston and spring, which exert internal pressure. Occasionally the operator presses the valve with his thumb to release some grease to the center. When released, the valve is returned to the closed position by the grease under pressure.

The operator knows the cylinder is nearly empty when the valve is slow to return to the closed position. *A. Vetsch, Steffisburg Sta., Switzerland.*



Simple Flat Fixture Holds Small Parts for Grinding

PROBABLY the simplest and least expensive way to hold small, regular non-magnetic parts is to clamp them in a hollowed-out steel holder. The holder is end-milled or sawed out to fit a number of the parts, and it is drilled and tapped in one end for a clamping setscrew. It must be made slightly thinner than the finished thickness of the parts. Magnetic power in the grinding table holds the steel fixture in place. *Roger Isetts, Kenosha, Wis.*



Miniature Clamp Is Held In Bench Vise

THIS SWIVEL CLAMP can be held in a machinist's vise to hold small die parts at any angle. Essentially it is a paralleled clamp, with another clamp attached to one bar. The smaller clamp grips on a ball that is machined on the end of a piece of steel, which, in turn, is clamped in the vise. The clamp is especially useful for holding small parts which have to be inspected or worked with hand tools. *Daniel H. Spofford, Hartford, Conn.*

Surface Grinding Trues Jaws

HERE IS a way of truing up universal-chuck jaws that is accurate and hard to beat for speed. Stock is first chucked so the outside ends of all jaws will project from the chuck. Then the jaws are ground with an attachment on the lathe.

After the outside ends of the jaws are ground concentric with the lathe spindle, remove them from the chuck and clamp them against an angle plate on the magnetic table of a surface grinder. The clamping surfaces of the three jaws can now be ground off flat. This assures perfect parallelism with the outside edges of the jaws.

I have ground a number of chuck-jaw sets in this manner. The latest set was for a 6-in. chuck that later held some 1-in. stock within a thousandth of perfect center. *Maurice Barriere, Montreal, Quebec.*

$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

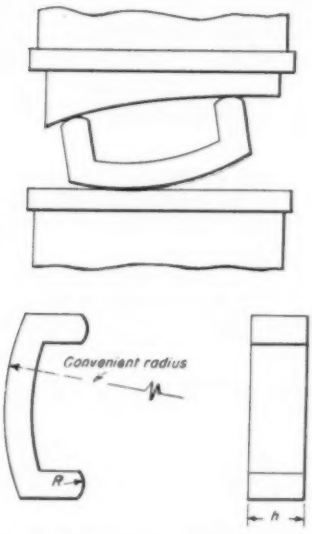
REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author —every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

83rd Winner:

Edward Farrell
Channel Planing

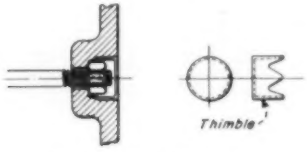


Double-Elbow, Non-Parallel Grips Odd-Shaped Parts

ODD SHAPES can be clamped in a milling-machine or a shaper vise if they are clamped at three points: two on one side, and one on the other. This clamping aid, in effect, does just that, because only one place along the curve toward the vise jaw will contact the jaw.

The aid should be made of tough and fairly rigid steel, and should be of as thick a section as can be clamped with the part. The ends and back should be hard-surfaced.

Two such aids can often be employed to advantage, and some parts may be best gripped between two of the aids. A number of sizes can be made in a short time. *Gerhard Wenke, Los Angeles, Cal.*



Thimbles Seal Adding Machines

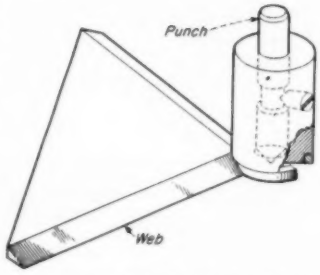
THERE ARE many accounting machines inclosed in two-part cases. Held together with bolts and nuts, they can be easily opened and tampered with. To prevent this, the counterbores were filled with solder, which flowed around the nuts. Unfortunately, this meant melting out the solder each time the machines had to be inspected or repaired.

We adopted a different method of sealing the machines. We tapered the lower part of the counter-bore for each bolt and made thimbles from 0.012-in. zinc stock. These were formed with tips or teeth that would turn when they were pressed into the counterbores and would jam against the nuts.

The thimbles are easy to replace, and they immediately show up any tampering because they cannot be removed in one piece. *R. Mery, Farmingdale, L.I.*

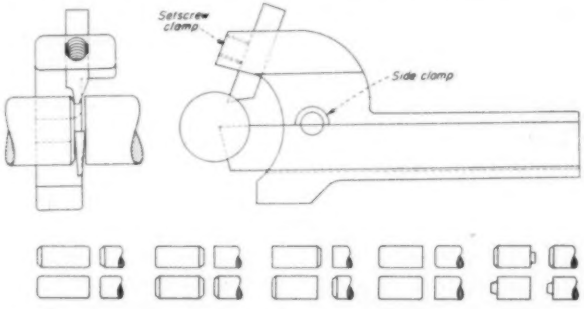
Knife-Edged Web Locates Centerpunch on Layout

THE CENTERPUNCH by Charles Buchalter in a recent issue struck me as being one of the best of the type I've ever seen. There are cases, though, when layout lines are quite close to the edge of the work and extreme accuracy is required to locate the punch mark.



The punch I devised has a sheet-metal web with two knife edges that are in line with the center of the punch and are at right angles to each other. With such a punch, ordinary layout in the middle of the work is easily done, and layout at a corner, as illustrated, can also be done with precision.

Because the tool is for occasional use only, it can be operated without a spring. A neck in the punch inside the barrel is turned, and a setscrew is fitted through a hole in the barrel to retain the punch. The sheet-metal arm was drilled, and a step in the lower end of the barrel was fitted into the hole and riveted over. *R. A. Lachmann, Chicago, Ill.*



Combination Tool Cuts Off and Turns

THE TOOL is made by bandsawing the contour out of high-carbon or tool-steel plate or bar stock, and then milling or shaping the recesses.

A standard cutoff blade and a square toolbit are clamped in the tool to perform a number of combinations of cutoff and turning. Although the cutoff blade cannot be adjusted except for length of cut, the square toolbit can be ground to any shape, or the toolbit hole can be slotted extra wide and shims can be used to shift the bit off to either side or to center it above the cutoff tool.

Chamfering or rounding can be done on either the first or second piece being cut from bar stock as the cutoff tool does the parting. *H. G. Frommer, Milwaukee, Wis.*

Mid-Century Equipment Inventory Due Nov. 3

100-page Report Will Give New Metalworking Data

NEW YORK—The Mid-Century Inventory of Metalworking equipment will be published in the November 3 issue of AMERICAN MACHINIST, it was announced last week. Data from thousands of plants which have been pouring in from every part of the country and every division of metalworking are now being summarized by trained statisticians.

Soon the editors of AMERICAN MACHINIST will begin to analyze the results and prepare them for publication in a special 100-page report.

The first Inventory of Metalworking Equipment was made in 1925. Since then the 5-year studies have become an established part of metal-working. In a statement issued recently, Harry E. Blythe, Chief of the Office of Produtcion Planning, Munitions Board, said, "We will await your new report with great interest, particularly since this Inventory is regarded as the only authentic source of information regarding the nation's resources of machine tools and production equipment. We believe it will prove invaluable in our mobilization planning activities."

156 Kinds of Metalworking Equipment

The Mid-Century Inventory will report upon 156 different kinds of metalworking equipment. It will show how many units of each type are in place in the metalworking industry and how these units are distributed geographically and by industrial divisions.

Of prime interest will be the data on the condition of equipment. The Inventory will show how much of each type of equipment is under 10 years old, 10 to 20 years old, and (for the first time) how much is over 20 years old.

Data will be presented in much greater detail and in more usable form than in any previous Inventory. Eighteen major marketing areas of metalworking will be reported individually and the rest of the U. S. will be covered in seven geographic areas. Industrially the data will be presented by 15 major sub-divisions of metalworking.

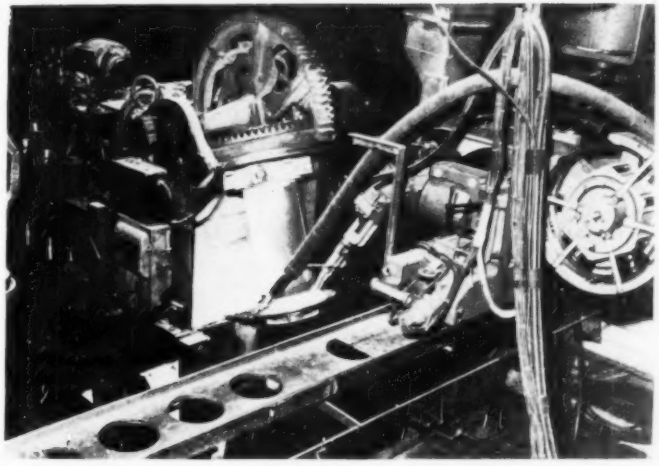
Divisions, both geographic and industrial, are designed to make possible a maximum degree of correlation of the data with the McGraw-Hill Census of Manufacturers and the U. S. Census of Manufactures.

Reveal Condition of Equipment

Special studies are being made which will reveal for the first time the condition of equipment in maintenance shops outside the metalworking industry and in college shops. Although these studies are not part of the detailed Inventory, they should make it possible to estimate roughly the quantities of equipment in these categories.

The primary purpose of the maintenance study is to give an idea of the type and quantity of equipment for this purpose, and—most important—to show its age. No data has heretofore been available on this important subject except for isolated shops.

The November 3 issue of AMERICAN MACHINIST, which will contain the Mid-Century Inventory of Metalworking Equipment, will be priced at $2.00 a copy.



MECHANIZING DOUBLES OUTPUT *— Gardner-Denver assembles a 1½x7⅞-in. gland ring to an 8x26-in. alloy-steel pump liner with top and bottom vee welds. A weld positioner on an air piston makes both welds without changing position of the Unionmelt welding machine. A sheet metal collar supports the welding composition. Here the second and lower weld is being made. For the first, the positioner is dropped enough so it can be revolved 180 degrees. The positioner rotates the liner so the 28-in. weld is made in 2½ minutes. Production is now four units per hour, double the hand rate*

$112 Million in Machinery, Vehicle Authorizations

WASHINGTON—ECA procurement authorizations issued during July for machinery and vehicles totaled $112,400,000, bringing the total to date for these two categories to $777,800,000.

A breakdown of the authorizations of $559,100,000 so far for machinery and equipment follows: construction, mining and conveying equipment, $95,800,000; machine tools, $61,100,000; electrical machinery and apparatus, $53,200,000; metalworking machinery, except machine tools, $50,500,000; engines and turbines, $17,600,000; industrial machinery, $165,800,000; agricultural machinery, except tractors, $52,800,000; tractors, agricultural, $44,300,000; other tractors, $18,000,000.

First-Quarter Profits Down for Metal and Machinery Corporations

WASHINGTON—Three months ago when fabricated metal and machinery manufacturing corporations began posting first-quarter earnings preliminary reports were mixed. Some were phenomenally good; others were just plain terrible. But there weren't enough figures to show businessmen clearly which way profits in general were heading.

Now practically all the figures are in. As reported by the Securities & Exchange Commission and the Federal Trade Commission they show that first-quarter profits of metals and machinery fabricators were definitely down.

In the first three months of 1949, the nation's fabricated metal and machinery manufacturing corporations made $333 million, after taxes. That's about 17% off from the previous quarter (October through December), about 16% below the corresponding period of 1948.

Drop in Earnings Shown

Here's what the profit and loss statement compiled by SEC and FTC shows about the drop in earnings (see statement below):

Sales were down—for the first quarter of this year sales of all metals and machinery fabricating corporations totaled $5,020 million. Volume was off $588 million—or 10%—from the preceding quarter and about $259 million—or 5%—from the corresponding period of last year. Reason: sales held steady but dealers cut down on their orders to work off inventories.

Costs stayed high—net operating expenses for the first three months were $4,472 million—down $491 million or 10%—from the last quarter of 1948. Reason: high overhead makes for high break-even points and keeps costs from dropping enough to offset completely the drop in sales.

No breakdown for the fabricated metals and machinery industries is available, but percentagewise the smaller corporations seemed to make out best of all manufacturing enterprises during the first quarter—reversing a trend that developed last year.

Total assets of fabricated metal and machinery corporations of all sizes were up about $113 million in the quarter—to about $14,361 million. An increase of $227 million in inventories was the biggest factor in the rise.

Aggregate Profit and Loss Statement of Fabricated Metal and Machinery Manufacturers

(Figures are in Millions of Dollars)

	1st Q 1948	4th Q 1948	1st Q 1949
Net Sales	5,279	5,608	5,020
Costs and expenses	4,641	4,963	4,472
Net operating profit	638	645	547
Other income or deductions—net	14	11	10
Net income before Federal income taxes	652	656	557
Provision for federal income taxes	254	257	224
Net income after federal income taxes	398	399	333
Surplus at close of preceding quarter	4,292	5,038	5,123
Dividends paid	97	228	110
Other surplus credits and charges—net	—36	—76	—35
Surplus at close of this quarter	4,558	5,132	5,311
Depreciation and depletion		89	88

New Renegotiation Basis For Military Contracts

WASHINGTON—A new basis for renegotiation of military contracts has been written into the Senate version of the Military's appropriations bill.

Under the new provisions all military contracts that are made by negotiation, regardless of what is purchased, are automatically subject to renegotiation. Contracts let through competitive bidding are not subject to the profit-limiting clause. In cases where both renegotiation and the Vinson-Trammell Act apply, renegotiation procedure will prevail and the VT Act will be suspended.

The new rules start with obligations of fiscal 1950 money.

The Renegotiation Act of 1948 remains the primer for procedure. Generally, this provides that a contract must have at least $100,000 worth of $1000 contracts before he can be renegotiated. The Senate's interpretation of this is that both old and new contracts will count toward the $100,000 floor. All those counted, however, have to be subject to renegotiation either under the old rules or the new ones.

Air-Cooled Auto Engines Debated by SAE

PORTLAND, Ore.—Use of air-cooled engines in motor cars, trucks, and buses was debated at the SAE National West Coast Meeting held here Aug. 15-17.

Air-cooled advantages were stressed before a technical session by C. F. Bachle, of Continental Aviation and Engineering Corp., Detroit, Mich., who said that while the air-cooled powerplants might now be somewhat noisier and more expensive of production than liquid-cooled engines, they offer such advantages as operating efficiencies under extremes of heat and cold, elimination of plumbing and attendant difficulties, savings of one-half to two-thirds in weight, quicker warm-up, and reduced power loss through cooling. Mr. Bachle added that six-cylinder 75 hp and eight-cylinder 100 hp air-cooled engines with vertical crankshafts are admirably suited to rear-mounting in passenger cars.

***TIPPING BODY** built by Netam of Rotterdam saves ground storage space by allowing dumps up to 11½ feet high. Longer stroke of hydraulic mechanism is achieved by fitting two vertically-mounted triple-expanding cylinders, served by a pump driven by the gearbox power takeoff. The body can be converted into an ordinary rear tipper*

75¢ Hourly Wage Almost Certain

WASHINGTON—It is now almost certain that Congress will increase the minimum wage from 40¢ to 75¢ an hour—and do it this session.

The House last week voted a bill raising the floor to 75¢; the Senate Labor Committee had already approved the 75¢ minimum, unanimously. The whole Senate will vote on it before adjournment.

If the boost goes through, it will mean a statutory pay hike for about 1.5-million workers out of the 22-million now covered by the act. An undetermined—but greater—number will get raises as employers adjust pay scales to maintain differentials between jobs, plants, areas, and industries.

The only question yet to be settled is: Who will have to comply with the new law?

The House amended the wage-hour act substantially; it took out from coverage most local retail businesses and fringe industries that process agricultural commodities.

The bill the Senate will debate—maybe next week—doesn't exempt any workers now covered.

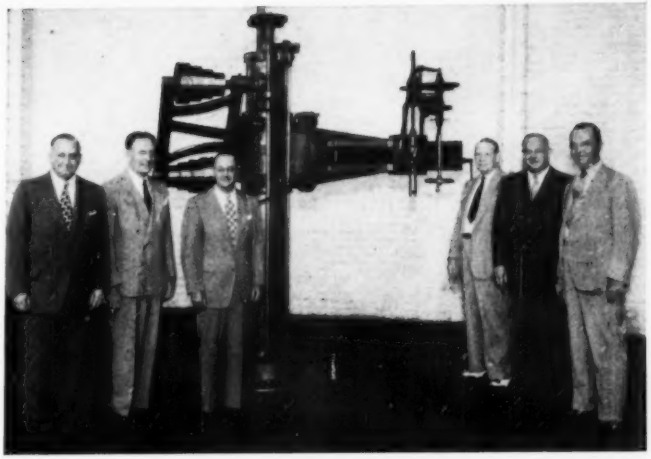
However, Republican Senators Taft and Donnell, when they voted for the bill in Committee, said they would plug for coverage changes.

The coverage issue is important on two counts, for exemptions involve not only the minimum wage but also premium-pay requirements, too. A businessman whose industry is removed from the act's coverage would be exempt from paying overtime for work in excess of 40 hours a week.

One main exemption of the House bill: If you have a crew washing the windows or mowing the lawns of a plant that produces for interstate commerce, you would not have to meet wage-hour standards.

C. E. Wilson Marks Half-Century Of Service with GE This Month

NEW YORK—Charles E. Wilson, president of the General Electric Co., on Sept. 2 marked a half century of service with GE. From an office boy at Sprague Electric Co., one of the organizations which went to make up GE, Mr. Wilson's career is marked by such advancements as: assistant manager of the Bridgeport works in 1925; manager of the merchandise dept., 1930; vice president in December, 1930; executive vice president of GE in 1937; president in 1939. During the last war he left GE for Washington where, in Feb., 1942, he became executive vice chairman of the War Production Board. Returning to GE in Aug., 1944, he was again elected a director and president of the company.



***CINCINNATI BICKFORD** Tool Co. officers, standing before an old radial drill, are (left to right), L. Lee Schauer, vice president and chief engineer; Paul E. Heckel, secretary; Neil C. Schauer, vice president and sales manager; G. P. Gradolf, chairman of board and treasurer; O. E. Schauer, president and general manager; C. C. Slete, assistant treasurer*

Cincinnati Bickford Celebrates Its Seventy-Fifth Anniversary

CINCINNATI—The Cincinnati Bickford Tool Co. is celebrating this year its seventy-fifth anniversary in the machine tool business.

The company began its operations in 1874 when Henry Bickford went to Cincinnati from New Hampshire and started to build upright drilling machines in a small room at Front and Pike Streets. Three years later the firm was taken over by the Bickford Drill Co., which continued to make upright drills in the same location.

A few years after that, the company expanded into the radial drill field. A four-story building was erected and the company's name changed to Bickford Drill & Tool Co. Gradually only radial drills were made in this plant, upright drills being discontinued.

Built Upright Drilling Machines

August H. Tuechter was connected with both the Bickford Drill Co. and Bickford Drill & Tool Co. In 1894 he, together with Sherman C. Schauer, who had been with the Hamilton Machine Tool Co., formed the Cincinnati Machine Tool Co. and started to build upright drilling machines, expanding the business into a bigger plant in 1904.

In 1909 the Cincinnati Machine Tool Co. and the Bickford Drill & Tool Co. were merged into the Cincinnati Bickford Tool Co. The following year a new building was erected in Oakley on the company's present site, the manufacture of upright and radial drilling machines being continued.

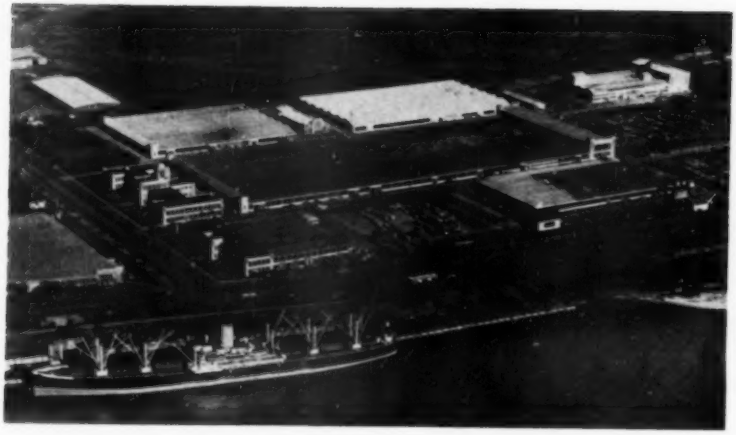
Mr. Schauer died in 1918. At his death he was vice president and general manager. Mr. Tuechter continued as president and George P. Gradolf was named vice president and treasurer.

"Super Service" Identifies Products

In 1925 the company's products became identified under the trademark name of "Super Service," the name being associated with a new line of products which included the all-geared and antifriction-bearing drilling machines. A major expansion and construction program was undertaken in 1941 and 1942, the factory floor space being doubled and a new office and engineering building erected.

Mr. Tuechter's death in 1947 resulted in a complete reorganization of the directorship of the company. For many years the only directors had been Mr. Tuechter, Mr. Gradolf and O. E. Schauer, son of Sherman C. Schauer, one of the founders. The realignment early in 1948 was as shown in the photograph above.

Mr. Gradolf has been associated with Cincinnati Bickford for more than 50 years, a good portion of that time as vice president and treasurer.



***ENGINES**, transmissions and other mechanical components for the Holden are machined and assembled at the Fishermen's Bend plant. Forgings are supplied by outside interests; gray-iron castings are produced here in a $1 million mechanized foundry*

Australia Produces American-Designed Holden Car

MELBOURNE (McGraw-Hill World News)—American production methods geared to an output of 20,000 cars per year now provide the Australian market with a roomy, short-wheelbase automobile for $2200 f.o.b. That is less money than paid for imported Chevrolets (unobtainable in volume because of exchange restrictions) or the smaller European cars.

The Holden is the fruit of effort by General Motors' Overseas Division to manufacture automobiles with Dominion materials and labor and without the benefit of government subsidy. Presently about 95% of the car by weight is derived from local sources.

Before getting into production, General Motors-Holden staked $28 million on development, plus expansion and equipment of the Fishermen's Bend plant near Port Melbourne and the Woodville body plant. These facilities were used prewar for assembly of imported chassis and production of Australian-built bodies. With about 8350 employees, GMH is now said to be the country's second-largest private employer.

Raw Materials Situation Surveyed

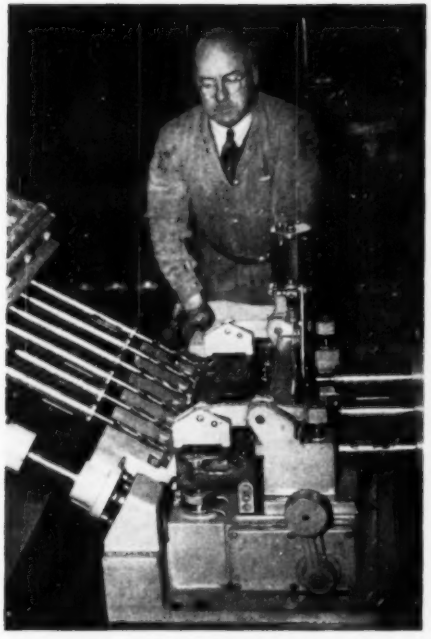
The decision to manufacture the Holden was reached after surveying the potential capacity and ability of Australian suppliers and the raw-materials situation. In a country where motor cars had never been built, it was understandable that difficulties would be experienced, in the early stages, in obtaining continuity of acceptable components in the required quantities. Therefore, process engineers and expeditors spent much time in the field, and as a result progress is being made as Australian firms seek to improve their methods and deliveries.

In the long run, Australian economy is bound to be importantly affected by the GMH enterprise. Metalworking there will be raised to a new level of efficiency. And the ferment of high GM wages will have its effect. Production workers are paid about $25 per week, skilled workers $27-$30. These are excellent wages in an economy where most persons are engaged in general trade or farming.

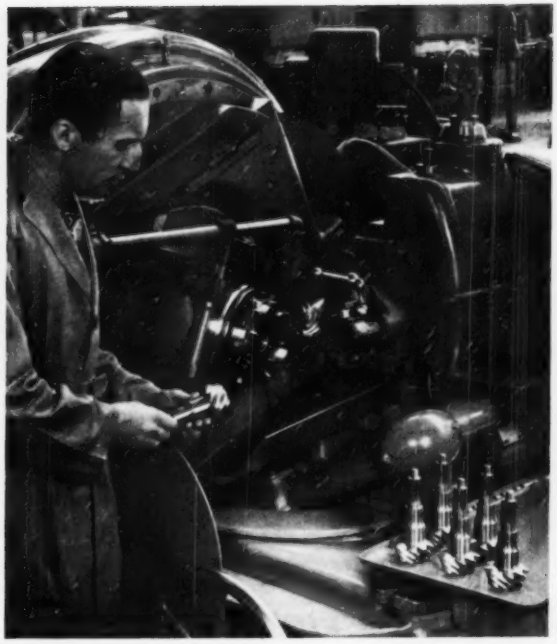
While the Holden enterprise is having its impact on the Australian economy, the time is probably not ripe for non-automotive companies to go into the Dominion on a large scale for lack of a commodity that can be sold. If the local car market sloughs off, Holden might easily expand its sales to New Zealand, the Dutch Indies, Malay States and perhaps India. Note: GMH would welcome automotive competition, provided it does not receive special consideration from the government, such as bounties or subsidies.

Processing methods at the Fishermen's Bend and Woodville plants are comparable in many respects to those used in some GM parts plants and car-producing divisions in the U.S., except that no ultra high-production setups are used. Most machine tools—single-purpose and general-purpose—are American built, but British, Australian and Swiss equipment is also installed. The problem confronting management was to supply enough equipment to reduce the number of setups to an economical figure, rather than to worry about idle machine time.

***INTEGRAL BODY AND FRAME**, produced at the Woodville plant, reduces weight of the Detroit-designed Holden to 2230 lb., yet body seats 5 to 6 persons. Car has 103-in. wheelbase, SAE-rated 21.6-hp engine of 6.5:1 compression ratio, and fuel economy of 30-35 mpg*

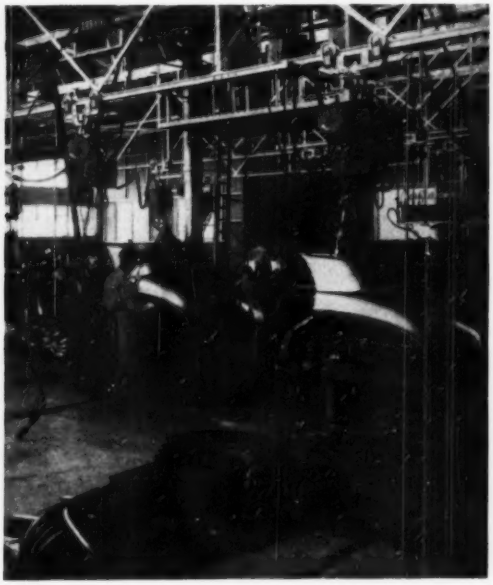


DESPITE LOW ANNUAL REQUIREMENTS, *single-purpose tools are installed to avoid excessive labor charges and setup changes. Here the spark plug holes in the cylinder head are gang drilled*



COST CF TRAINING OPERATORS *for mass-production equipment runs from $120 to $165, and incentives must be offered to keep men on the job after being expensively recruited and trained by the company*

ROOF-PANEL ASSEMBLY METHODS *represent a balance between equipment and labor cost for the anticipated volume. Air-operated toggle clamps firmly locate the parts in a jig conforming to the roof contours*

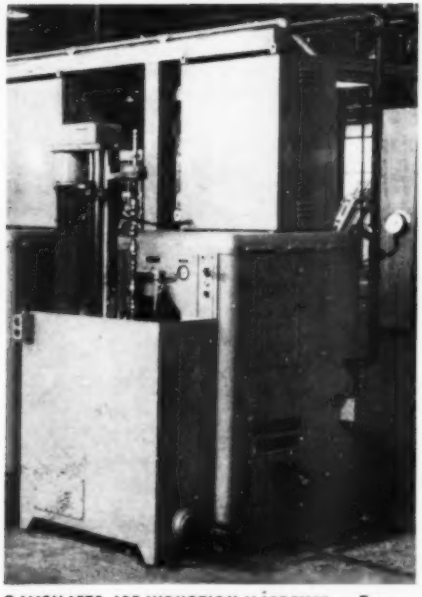


GUN WELDERS *are used to assemble Holden rear quarter panels. Components are located in a sub-assembly jig closely resembling those that have been extensively used in America*

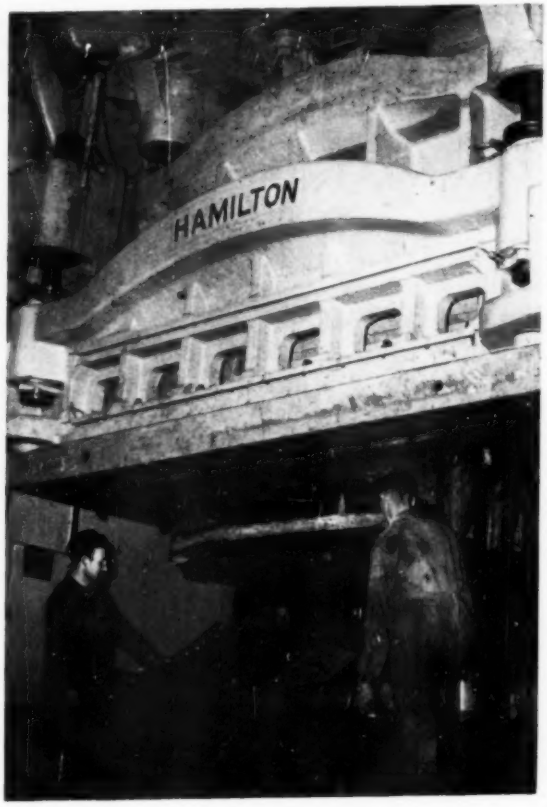
U.S.-Designed Holden Car Built in Australia

WATER-WASH SPRAY BOOTHS *(left) with filtered-air inlet and adequate lighting are used for applying lacquer to bodies*

HEAT-TREATMENT *is carried out in modern equipment, only a portion of which is shown above. In this area are seen a parts washing machine, high-temperature furnaces, lead pot, quench tank, continuous furnace and a Wheelabrator shot-peening machine for axle shafts (above)*



CAMSHAFTS ARE INDUCTION HARDENED *on Tocco equipment (above), three machines being installed for the purpose. Cams, journals and gear are hardened independently*



PRESSES IN CAPACITIES *up to 1500 tons are installed at the Woodville plant to produce hundreds of individual steel parts for Holden bodies. Die changes must be made frequently; parts banks are larger than usual to avoid lack of material at assembly (right)*

Detroit

TIMETABLE GIVEN FOR 1950 CARS . . . TOOLING SHOPS STILL SLACK

FORD PLANT BOON TO BUFFALO . . . CONCERN OVER LABOR SITUATION

The center of gravity for new model introductions seems to be moving closer toward November. This looks like the year in which the industry is beginning to straighten out the all-through-the-year announcement situation which has prevailed since the end of the war.

As matters stand, most car makers will be announcing their 1950 models during the fourth quarter. The timetable seems something like this:

Studebaker—Already announced.

Buick — "Special" series announced; other lines due in November.

Other General Motors lines (Chevrolet, Pontiac, Olds, Cadillac)—Scattered through the last quarter, most of them in the last two months, with possible overlapping into January.

Chrysler lines (Plymouth, Dodge, DeSoto, Chrysler)—Close toward the end of the year, maybe January.

Ford lines (Ford, Mercury, Lincoln)—Approximately November.

Hudson—Fourth quarter.

Packard—After the first of the year, perhaps not until spring.

Nash—Within the next few weeks.

Return of Feast or Famine

This year saw most changes in minor category. Next year, though, may be different. In any case, the bunching of new model unveilings will bring back the traditional conditions of feast or famine in the tool, die, and machine shops. Once again they will be shooting for compact delivery dates. The result: more overtime work in peak seasons than in the past; more shutdowns in between.

Meanwhile, there is comparatively little feasting. There are a few small programs being worked on, if indeed they are big enough to be called "programs"—the face-lifting activity for most of the 1950 models, the modernizing of jobs here and there to improve efficiency. But they are not keeping any segment of the equipment industry significantly busy, except in isolated specific instances.

There is some talk of war work in the air—tooling programs which are to be carried through paper stages in some cases, through actual manufacturing (for putting on the shelf) in others. However, none of these being discussed seems of any real volume, nor is there any great pressure behind it.

Something of this slackness is evidenced in the reports covering representative Detroit tooling shops. Although they have had a quiet revival during the past few months, with modest 1950 model sheet metal work being placed, they are still operating at an average level almost 25% below that which prevailed a year ago. The 1948 level, incidentally, was only slightly different from that at this time in 1947—apt evidence of how business in the tool and die shops fell overboard since last year.

$25 Million for Ford Stamping Plant

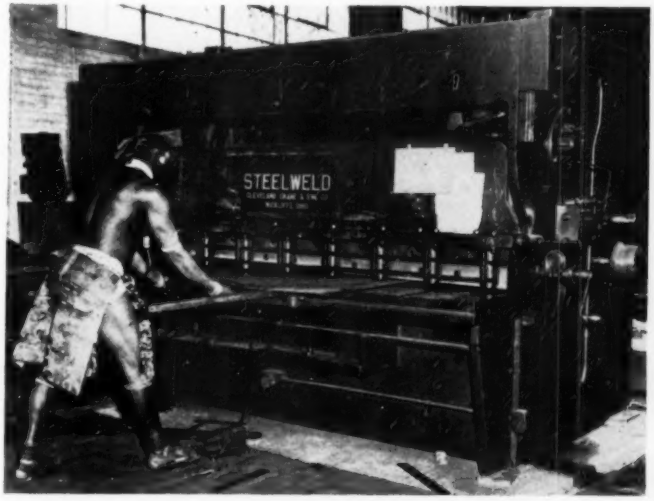
However, good news for the press makers comes out of Ford, which is letting contracts for a new stamping plant in Hamburg township, near Buffalo. Total cost of plant and equipment is unofficially estimated at no less than $25 million. Die shop facilities will be included along with the press equipment. Total employment will be about 3,500 people.

This will be a big operation. It will produce about 42% of Ford's total stamping requirements and will doubtless ship these through to eastern assembly points—Buffalo, Edgewater and Metuchen, N. J., Norfolk, Somerville, Mass., possibly others. Ford's Rouge pressed steel building will supply another 45% of the company's total requirements. Outside suppliers will take care of the remaining 13%.

These new ratios will not come into full effect for about two years, that being the target period for capacity operations in the new facility. When they do appear, they will be a blow to Murray Corp. and Budd Corp., which together supply the bulk of the requirements Ford buys outside today—currently estimated at 51% of total stampings used.

In addition to the Buffalo program, Ford will do some revamping in the pressed steel shops at the Rouge. Some of the equipment there will be replaced, and much of it will be moved around with an eye to improving the efficiency of operations. Today the Rouge plant supplies approximately half of Ford's needs; the reduction of that ratio to 45% will provide some needed elbow room which is figured on as a key for improved output.

More concern is being manifested over the labor situation. Machinery makers are bothered enough about the prices they have to put on the equipment they sell without burdening it with another several cents an hour. It seems evident that most of them will stoutly resist being clubbed into following a pattern of any sort, whether coined by Big Steel or Ford or both. Their own situations do not permit wage advances at this time, they say—in fact they lay part of the current slackness in ordering to the costs required for retooling.



***HOW TO KEEP COOL** and improve plant efficiency in hot September weather is demonstrated by this native Zulu shear operator. The Steelweld shear, built by The Cleveland Crane & Engineering Co., Wickliffe, Ohio, is in the plant of Steel & Power Products, Ltd., Johannesburg, South Africa*

Names in the News

E. V. Rippingille, Jr.

E. V. Rippingille, Jr., has been named president and general manager of General Motors Diesel, Ltd., a GM subsidiary which will begin construction immediately of a new plant at London, Ontario, for the manufacture of diesel-electric locomotives in Canada. Mr. Rippingille was manager of plant No. 2 of GM's Electro-Motive Division, near Chicago, until Aug. 1.

Stanley J. Retzlaff has rejoined Allis-Chalmers Mfg. Co., Milwaukee, as manager of sales to machinery manufacturers. **J. F. Fitzsimmons** has been named manager of commercial research department, succeeding **J. R. Reed,** resigned.

Fred T. Miller and **R. A. Stumm, Jr.,** have been elected vice presidents of Adel Precision Products Corp., Burbank, Calif., and Huntington, W. Va. Mr. Miller, previously the firm's general sales manager, will be in charge of engineering and sales at the Burbank Division, while Mr. Stumm, previously assistant to the president, will be in charge of manufacturing at Burbank.

George T. Ladd has been named production engineer and **Howard W. Crusey,** sales engineer, of the Al-Fin Division of Fairchild Engine & Airplane Corp., Farmingdale, N. Y.

R. H. Davies recently joined Baker-Raulang Co., Cleveland, as manager of engineering. In the past he was associated with the Lockheed Aircraft Corp., Northrop Aircraft, Inc., and Henry J. Kaiser Co. For the past five and a half years he was with Lincoln Electric Co.

Hayward F. York has been named assistant plant engineer of the Plymouth Motor Corp. plant, Detroit. Since 1943 he has been plant layout engineer.

R. D. Jablonsky has been named district manager at the St. Charles, Mo., plant of the American Car & Foundry Co., succeeding the late **W. C. Roederer.**

Edgar F. Wait

Edgar F. Wait has been named assistant plant manager of the Ford Motor Co.'s Highland Park operations. **C. F. Hancock** has been made resident controller; **Clifford E. Bernard,** general superintendent for trim, paint and artificial leather manufacturing, and **Clarence W. Brown,** manager of works standards.

Ralph Strang has been named to represent Amertool Engineering Service for Central Europe, organized about two years ago by a group of American machine tool manufacturers to bring the benefits of American production methods and equipment to industry abroad. He will work through Stenzel & Co., Wiesbaden, Germany.

R. E. Bryant has been named manager of Wagner Electric Corp.'s automotive and electrical branch at Buffalo, New York.

James P. Malmstrom has been named assistant to the general manager of the Standard-Thomson Corp., Dayton, Ohio. Former chief engineer for the Scientiae Corp. in Cleveland, he recently established Standard-Thomson's new electronics and aircraft equipment division. **Charles W. Wood** has joined the company as a design engineer, after being with Jet Heat Inc., New York, and General Electric Co.

Watson P. Hall has joined the Toronto, Ontario sales office of American Wheelabrator & Equipment Corp., Mishawaka, Ind. For the past three years he has been a member of the service enginering staff.

Leo J. Pantas has been named works manager of the Yale & Towne Mfg. Co.'s Specialties Division plant in Salem, Va. Previously he served as manager of the company's Buffalo plant. During the war Mr. Pantas, while directing phases of war production, organized a department to manufacture parts for Vought-Corsair fighter planes.

(Continued on page 194)

OBITUARIES

James P. English, 78, general supt. of the Bethlehem Pacific Coast Steel Corp., Seattle, Wash., until his retirement in 1937, died Aug. 11. He was chairman of the board of James D. English Steel Co., Tacoma, Wash.

Harry F. Harper, 68, retired president of Motor Wheel Corp., Lansing, Mich., died Aug. 8. He helped organize Motor Wheel in 1929 and was president and general manager until he retired in 1946.

William C. Theller, 65, assistant supt. at Hendy Iron Works, Sunnyvale, Calif., for many years, died July 10.

Leo H. McGowan, 61, chairman of the Standard Steel Corp., Los Angeles, died July 28. He was president of the W. C. Mehanite Corp., and formerly was vice president of the Hedges-Walsh-Weidner Co., Chattanooga.

Harry C. Kugler, president and director of Superior Wire Cloth Co., Hungerford, Pa., died July 14.

Edward J. Burnell

Edward J. Burnell, vice president and general sales manager of the Link-Belt Co., Chicago, died July 22. He served with the War Production Board in World War II.

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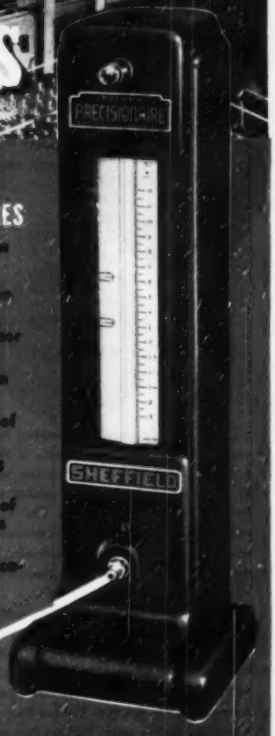

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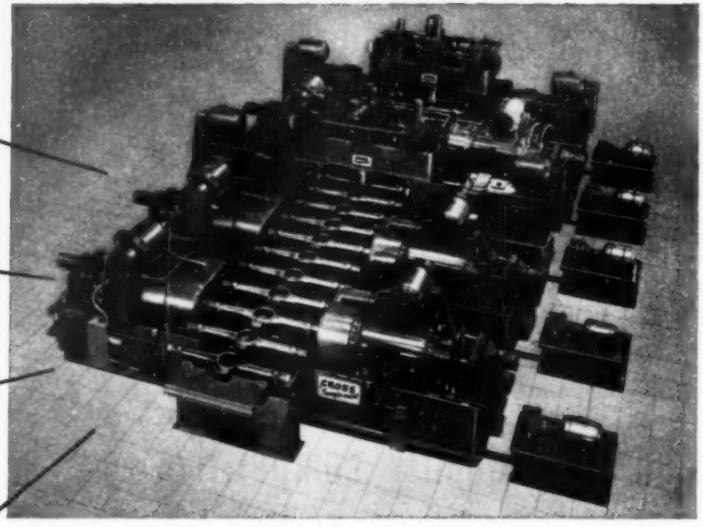

Another cost-cutting application of VICKERS HYDRAULICS

The Cross Transfer-matic illustrated here uses Vickers Hydraulic Controls in making substantial reductions in the cost of machining axle housings.

A hydraulic transfer mechanism automatically advances the housings (two at a time) from one machine to another. Hydraulic circuits of the individual machines provide for correct progressive positioning and clamping together with the traversing and feeding of the tool slides. Interlocks assure accurate positioning and secure clamping before cutting operations begin . . . also clearance of all tools before transfer to next station.

Exceptional flexibility is provided in that machines can be added, removed or shifted. Transfer mechanism is independent and moves work only from machine to machine. Locating and clamping are done by work holding fixtures integral with each machine.

Indicative of the many advantages of Vickers Hydraulics are gasket mounted Vickers Control Valves that simplify installation, save space and make adjustment easier. Vickers Power Units are compact "packages" that simplify hydraulic system design and reduce costs.

Vickers Hydraulics are particularly adapted to provide the complex motions and operations needed in highly automatic machines. Get in touch with the Vickers Application Engineering Office nearest you for information on how Vickers Hydraulics can improve your machinery.

Representative Vickers Hydraulic Pumps and Controls Used on Cross Transfer-matic

Power Unit, Bulletin 46-43a

4-Way Valve, Pilot Operated, Solenoid Controlled, Bulletin 48-27

Flow Control Valve, Bulletin 45-35

Sequence Valve

Check Valve

Pressure Reducing Valve

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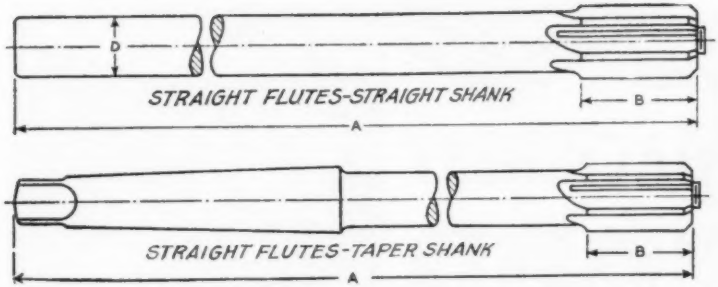
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Expansion Chucking Reamers*



All reamers high-speed steel; carbon steel expansion reamers and all sizes and dimensions not listed are special

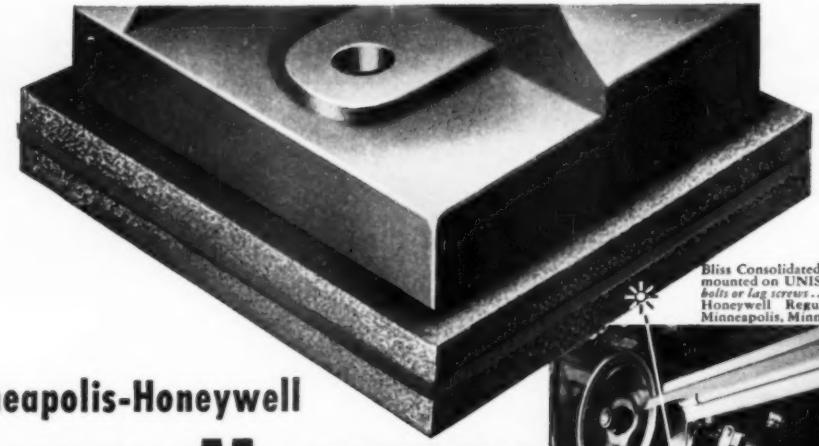
DIA.	LENGTH A	FLUTE LENGTH B	STRAIGHT SHANK DIA.	TAPER SHANK NO.
3/8	7	3/4	5/16	1
13/32	7	3/4	5/16	1
7/16	7	7/8	3/8	1
15/32	7	7/8	3/8	1
1/2	8	1	7/16	1
17/32	8	1	7/16	1
9/16	8	1 1/8	7/16	1
19/32	8	1 1/8	7/16	1
5/8	9	1 1/4	9/16	2
21/32	9	1 1/4	9/16	2
11/16	9	1 1/4	9/16	2
23/32	9	1 1/4	9/16	2
3/4	9 1/2	1 3/8	5/8	2
25/32	9 1/2	1 3/8	5/8	2
13/16	9 1/2	1 3/8	5/8	2
27/32	9 1/2	1 3/8	5/8	2
7/8	10	1 1/2	3/4	2
29/32	10	1 1/2	3/4	2
15/16	10	1 1/2	3/4	3
31/32	10	1 1/2	3/4	3
1	10 1/2	1 5/8	7/8	3
1 1/32	10 1/2	1 5/8	7/8	3
1 1/16	10 1/2	1 5/8	7/8	3
1 3/32	10 1/2	1 5/8	7/8	3
1 1/8	11	1 3/4	7/8	3
1 5/32	11	1 3/4	7/8	3
1 3/16	11	1 3/4	1	3
1 7/32	11	1 3/4	1	3

DIA.	LENGTH A	FLUTE LENGTH B	STRAIGHT SHANK DIA.	TAPER SHANK NO.
1 1/4	11 1/2	1 7/8	1	4
1 5/16	11 1/2	1 7/8	1	4
1 3/8	12	2	1	4
1 7/16	12	2	1 1/4	4
1 1/2	12 1/2	2 1/8	1 1/4	4
1 9/16	12 1/2	2 1/8	1 1/4	4
1 5/8	13	2 1/4	1 1/4	4
1 11/16	13	2 1/4	1 1/4	4
1 3/4	13 1/2	2 3/8	1 1/4	5
1 13/16	13 1/2	2 3/8	1 1/2	5
1 7/8	14	2 1/2	1 1/2	5
1 15/16	14	2 1/2	1 1/2	5
2	14	2 1/2	1 1/2	5
2 1/16	14 1/2	2 3/4	1 1/2	5
2 1/8	14 1/2	2 3/4	1 1/2	5
2 3/16	14 1/2	2 3/4	1 3/4	5
2 1/4	14 1/2	2 3/4	1 3/4	5
2 5/16	15	3	1 3/4	5
2 3/8	15	3	1 3/4	5
2 7/16	15	3	1 3/4	5
2 1/2	15	3	1 3/4	5
2 9/16	15 1/2	3 1/4	2	5
2 5/8	15 1/2	3 1/4	2	5
2 11/16	15 1/2	3 1/4	2	5
2 3/4	15 1/2	3 1/4	2	5
2 13/16	16	3 1/2	2	5
2 7/8	16	3 1/2	2	5
2 15/16	16	3 1/2	2	5
3	16	3 1/2	2	5

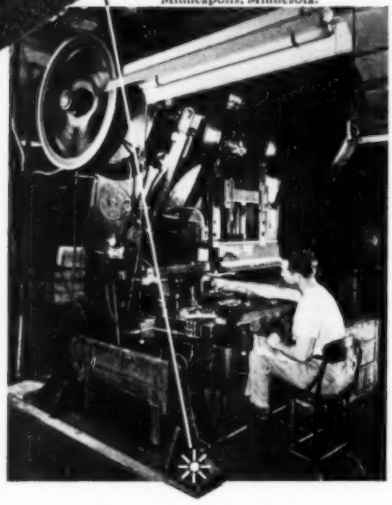
*American Standard ASA B5.14-1949 published by the American Society of Mechanical Engineers

NUMBER OF FLUTES	
Reamer Dia	Number of Flutes
3/8—15/32	4 to 6
1/2—31/32	6 to 8
1 —1 11/16	8 to 10
1 3/4—1 15/16	8 to 12

NUMBER OF FLUTES	
Reamer Dia	Number of Flutes
2—2 5/16	10 to 12
2 3/8—2 11/16	10 to 14
2 3/4—3	10 to 15



Bliss Consolidated #8 Punch Press mounted on UNISORB . . . *without bolts or lag screws* . . . at Minneapolis-Honeywell Regulator Company, Minneapolis, Minnesota.



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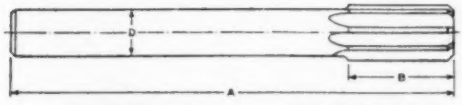
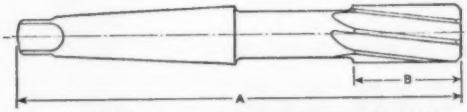
Fluted Chucking Reamers *(Straight and Spiral Flutes)* *



STRAIGHT FLUTES—STRAIGHT SHANK

DIA.	LENGTH A	FLUTE LENGTH B	STRAIGHT SHANK DIA	TAPER SHANK NO.
1/8	3 1/2	7/8	7/64	
5/32	4	1	9/64	
3/16	4 1/2	1 1/8	11/64	
7/32	5	1 1/4	13/64	
1/4	6	1 1/2	15/64	1
9/32	6	1 1/2	15/64	1
5/16	6	1 1/2	9/32	1
11/32	6	1 1/2	9/32	1
3/8	7	1 3/4	5/16	1
13/32	7	1 3/4	5/16	1
7/16	7	1 3/4	3/8	1
15/32	7	1 3/4	3/8	1
1/2	8	2	7/16	1
17/32	8	2	7/16	1
9/16	8	2	7/16	1
19/32	8	2	7/16	1
5/8	9	2 1/4	9/16	2
21/32	9	2 1/4	9/16	2



SPIRAL FLUTES—TAPERED SHANK

DIA.	LENGTH A	FLUTE LENGTH B	STRAIGHT SHANK DIA.	TAPER SHANK NO.
11/16	9	2 1/4	9/16	2
23/32	9	2 1/4	9/16	2
3/4	9 1/2	2 1/2	5/8	2
25/32	9 1/2	2 1/2	5/8	2
13/16	9 1/2	2 1/2	5/8	2
27/32	9 1/2	2 1/2	5/8	2
7/8	10	2 5/8	3/4	2
29/32	10	2 5/8	3/4	2
15/16	10	2 5/8	3/4	3
31/32	10	2 5/8	3/4	3
1	10 1/2	2 3/4	7/8	3
1 1/16	10 1/2	2 3/4	7/8	3
1 1/8	11	2 7/8	7/8	3
1 3/16	11	2 7/8	1	3
1 1/4	11 1/2	3	1	4
1 5/16	11 1/2	3	1	4
1 3/8	12	3 1/4	1	4
1 7/16	12	3 1/4	1 1/4	4
1 1/2	12 1/2	3 1/2	1 1/4	4

Fluted chucking reamers are made with straight and tapered shanks and with straight or spiral flutes in the above sizes. Rose chucking reamers are made with straight or tapered shanks in the above sizes, except 17/32, 19/32, 21/32, 23/32, 25/32, 27/32 and 31/32-in. dia.

These reamers are used on turret lathes and screw machines. Conventional chucking reamers have a slight chamfer for end cutting and the relief is ground back of the cutting edge for the full length of the land. In rose reamers, the lands are ground cylindrically, without radial relief, and they are designed to cut on the end.

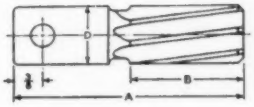
Diameter tolerances are: to ¼ in. incl.—0.0001 to 0.0004 in. plus; over ⅜ to 1 in. incl.—0.0001 to 0.0005 in. plus; over 1 in.—0.0002 to 0.0006 in. plus.

STUB SCREW MACHINE REAMERS

No.	Dia. Range	A	B	D	Flute
00	0.0600 to 0.066 incl.	1 3/4	1/2	1/8	4
0	0.0661 to 0.074 incl.	1 3/4	1/2	1/8	4
1	0.0741 to 0.084 incl.	1 3/4	1/2	1/8	4
2	0.0841 to 0.096 incl.	1 3/4	1/2	1/8	4
3	0.0961 to 0.126 incl.	2	3/4	1/8	4
4	0.1261 to 0.158 incl.	2 1/4	1	1/4	4
5	0.1581 to 0.188 incl.	2 1/4	1	1/4	4
6	0.1881 to 0.219 incl.	2 1/4	1	1/4	6
7	0.2191 to 0.251 incl.	2 1/4	1	1/4	6
8	0.2511 to 0.282 incl.	2 1/4	1	3/8	6
9	0.2821 to 0.313 incl.	2 1/4	1	3/8	6
10	0.3131 to 0.344 incl.	2 1/2	1 1/4	3/8	6
11	0.3441 to 0.376 incl.	2 1/2	1 1/4	3/8	6
12	0.3761 to 0.407 incl.	2 1/2	1 1/4	1/2	6
13	0.4071 to 0.439 incl.	2 1/2	1 1/4	1/2	6
14	0.4391 to 0.470 incl.	2 1/2	1 1/4	1/2	6
15	0.4701 to 0.505 incl.	2 1/2	1 1/4	1/2	6
16	0.5051 to 0.567 incl.	3	1 1/2	5/8	6
17	0.5671 to 0.630 incl.	3	1 1/2	5/8	6
18	0.6301 to 0.692 incl.	3	1 1/2	5/8	6
19	0.6921 to 0.755 incl.	3	1 1/2	3/4	8
20	0.7551 to 0.817 incl.	3	1 1/2	3/4	8
21	0.8171 to 0.880 incl.	3	1 1/2	3/4	8
22	0.8801 to 0.942 incl.	3	1 1/2	3/4	8
23	0.9421 to 1.010 incl.	3	1 1/2	3/4	8

Stub screw machine reamers are particularly adapted for use in floating holders, and the shank is provided with a pin hole for this purpose. These reamers are regularly furnished with right-hand cut and left-hand spiral flutes in any size within the range shown. Left-hand reamers and reamers with right-hand spiral flutes are special.

Diameter tolerances (plus) are: No. 00 to 7 incl.—0.0001 to 0.0004 in.; No. 8 to 23 incl.—0.0001 to 0.0005 in. incl.



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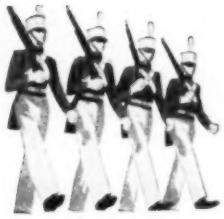

The constant UNIFORMITY of Mueller Brass Co. Rod saves tools, grinding, and "down" time. Brass Rod users throughout the United States and abroad know this and they continue to use it year after year. THEY ARE ACTUALLY PINNING MORE PROFIT TO THEIR COST SHEETS.

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Port Huron, Michigan

American Machinist REFERENCE BOOK SHEET

Protective Coatings For Steel

(Cementation Processes)

BY JEROME L. BLEIWEIS, Metal Finishing Consultant

Calorizing

Purpose—To produce an aluminum-iron alloy coating steel in order to protect the steel from oxidation and scaling at elevated temperatures.

Nature of Coatings—A solid solution of aluminum and iron in which the outer layer is rich in aluminum and the inner layer rich in iron. Usually the depth of penetration of aluminum is from 0.005 to 0.04 inch.

Treatment Procedure:

1. Pack articles to be treated in a drum in a mixture of powdered aluminum, oxide, and a small proportion (1 to 5%) of ammonium chloride.

2. Rotate the drum slowly as it is being heated (for about 5 hr at about 1740 F) and maintain a reducing atmosphere, usually of hydrogen, within it.

Notes and Comments:

1. The aluminum content employed in the process may vary from 5 to 50%, according to the service to which the treated piece is to be put.

2. Calorizing temperatures of 850 to 950 C have been recommended for iron and steel.

3. It is possible to calorize copper and brass, in which case temperatures of 200 to 800 C should be used.

4. The purpose of the alumina is to prevent coalescense of the particles of aluminum, as the temperature used is very considerably above that of the melting point of aluminum (660.2 C, 1220 F).

5. The aluminum and the chloride must be renewed from time to time as the mixture is used.

6. The calorizing process may be carried out by using steel previously coated with aluminum by the hot-dip process. Upon heating, the aluminum diffuses into the underlying metal, producing a coating which is essentially the same as that obtained by original calorizing method, although thinner and less protective.

7. Calorizing has found application in oil-refining equipment such as tube stills for cracking, also valves, retorts, condenser parts, stokers, roasters, rotary kilns, carburizing and heat-treated boxes, pyrometer protection tubes and burner nozzles.

Sherardizing

Purpose—To produce a coating of zinc on steels by heating of steel parts in an atmosphere of zinc dust. A zinc coating on steel affords corrosion resistance for the latter metal.

Nature of Coating—The coating produced consists of zinc alloys of definite composition. Near the base metal the alloy is $FeZn_5$; on the surface it is $FeZn_{10}$ with intermediate compositions in between. At temperatures over 419 C, particles of pure zinc may become attached bodily to the surface of the article.

Treatment Procedure:

1. Clean parts by vapor degreasing or alkaline cleaning.

2. Heavy scale is removed by sand-blasting or pickling.

3. Pack parts in drums containing finely powdered zinc.

4. Rotate the drums for several hours in a furnace at 650 to 750 F.

5. Remove parts and cool slowly so that a ductile coating will be formed.

Notes and Comments:

1. Sherardizing is not considered to be as effective as zinc or cadmium plating from the point of view of corrosion protection or operating economy.

2. The alloy coating is credited with increasing surface hardness and durability of base metal.

3. The quality of the zinc dust used, particularly its iron content, temperature, and period of heating all have an important effect on the coating produced.

4. A commercial "blue-dust," a byproduct in the usual method for smelting zinc, is the powdered material usually employed in this process, although a special form of zinc powdered to 100-mesh fineness is used to some extent in combination with the blue-dust, which contains approximately 85 to 90% metallic zinc and 5 to 8% zinc oxide.

5. For most purposes a rather low temperature is favored for the successful prosecution of this process, and 660-700 F has been recommended as desirable.

6. A sherardized coating produced at relatively high temperatures has a considerably higher iron content than does one made at lower temperatures, providing other operating conditions are maintained constant.

7. The temperature to be used also depends somewhat upon the composition of the zinc dust used. With a dust having an iron content of 7%, it is necessary to maintain the temperature at 840 F, in order to deposit a coating at the same rate as is produced from pure zinc dust at 700 F.

8. The process was developed by Sherard Cowper-Cowles.

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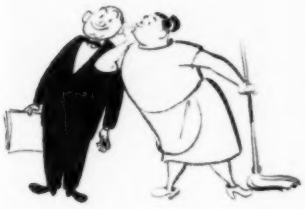


Grape Vine

THE BOARD CHAIRMAN and president of a big corporation decided to make two major executive shifts—but agreed to withhold the announcement for a week. On the day the changes were to be announced, the president called in his secretary, dictated the memo covering it and said: "Don't say a word about it to anybody."

"Why should I?" asked the sec. "Everybody knows—the cleanup woman told me last week."

Quarter-Century Report

PACKARD has spent $53 million in the last 25 years for new buildings and equipment, $28 million for engineering and development, and $73 million for new tools, according to George T. Christopher, president and general manager. He reported recently that profits on sales from 1924 through 1948 were only 4.47% of sales—compared with the 10% that most people think fair. . . . Packard has had 1498 employees attain 25 years' service since the company was founded 50 years ago. Of these, 1052 are still on the job. They are 10% of the total employment—not a bad record.

Itching Foot

ENGINEERS, as well as shop men, have the itch to travel at times. A new survey by the Bureau of Labor Statistics shows 20% of the engineers in 1946 were employed in a branch of engineering other than that for which they were trained. And these shifts do not occur only when jobs are hard—or easy—to get. Greatest degree of change was during the war years, when 8 to 14% of engineers shifted branch—mechanical engineering gained most and civil engineering lost most.

About 22% of engineers changed type of employer during the war. Engineers moved from self employment and State jobs to Federal and industrial jobs.

More than 30% of the engineers changed their jobs from one State to another between 1939 and 1946, principally in the years 1939 to 1943.

Boron

TWO SCIENTISTS at the Bureau of Standards have made extensive investigations of the effect of boron on cast iron. In general, boron increases the depth of chill and the hardness. It also decreases size and quantity of graphite particles, increases carbide content and produces an undercooling effect which becomes more pronounced with added boron.

Engineers' Jobs

BUREAU OF LABOR STATISTICS has just completed a comprehensive study of the employment outlook for engineers, to be published this Fall. High spots: Engineering is now the third largest profession. Jobs are expected to increase 100,000 in the next 10 or 12 years, to a total of 450,000, but present school enrollments are currently so high that graduates during the next four years will have trouble finding engineering jobs. Eventual annual demand will be for about twice the prewar total of graduates.

Younger engineers increase their salaries faster than older men. The greatest increase occurs in the first ten years. After about 30 years of experience, the salaries level off, even decline for M.E.'s. Mechanicals now start at a median of $225 per month, rise to $400 in ten years, $450 in 20 years, level out at about $525 at 30 years after school. A master's degree gives a slight salary advantage, a doctor's degree a considerable one.

Business Card

W. C. DENISON, JR., president of The Denison Engrg. Co., Columbus, Ohio, toured the world with the Town Hall World Seminar. His advertising agency thoughtfully provided him with a special 12-page booklet, "A Quick Review of Denison Products," which also lists all sales representatives, to hand out as a business card on his trip. That is practical merchandising.

Who Pays?

IN 1850, only 1% of our national income went to government—federal, state and local. In 1900, the figure had risen to 5%. Today, it is 25 to 30%. Are we following the lead of the older countries, where the government appropriates, through taxation, the earnings of its people and returns them in activities which, however worthy, do not build for the future? Are we depriving ourselves of the risk money that builds industrial activity?

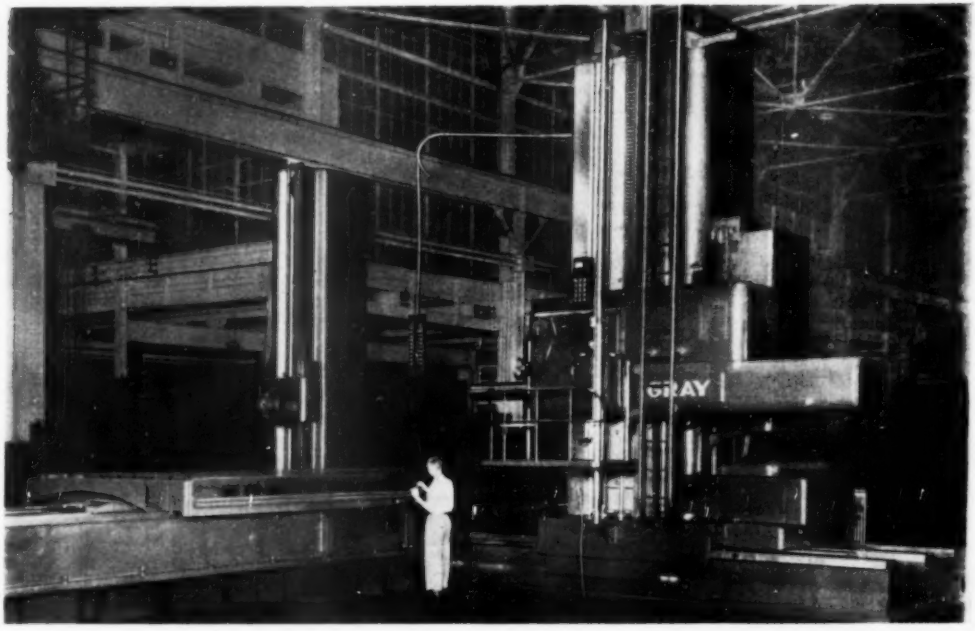
Glyptal-Vinylite

SINCE PUBLICATION of the article, "Pen and Ink Mark Gages," (*A.M.* March 24) we have had several requests for the formula of the Glyptal-Vinylite used as a protective coating over the markings. One came from Turin, Italy, and one from Germany. For those of you nearer at home who are wondering about it, the composition is a mixture of half and half Glyptal 1276 cement (General Electric Co., Chemical Dept., Pittsfield, Mass.) and Vinylite VYNS (Bakelite Corp., 30 E. 42nd St., N. Y., N. Y.). The Vinylite is dissolved in lower boiling point ketones, such as acetone, to approximately 20 per cent solids. The Glyptal, which imparts strength and adhesion to the mixture, is used as is. Proportions may be changed to suit particular circumstances but 50-50 has worked best at Kollsman.

Sound Mixing

LATEST EXPERIMENTS with high-frequency sound waves are in homogenizing paints. Sherwin - Williams chemists think that 150,000-cycle waves may end the need for stirring paint and avoid "flooding" and "floating" which affect color. The 2000-watt generator produces waves so strong they will ignite a piece of cotton in a few seconds, but the chemists aren't sure that homogenized paint will stay mixed.

New Shop Equipment



Built for Hydraulic Press Mfg. Co., this 175-ton planer-type horizontal boring, milling and drilling machine has 12-ft vertical feed, 17-ft horizontal feed, has a 9x20-ft table

Gray Builds 8-in. Planer-type Boring Machine

A 9x20-ft table capable of handling 80-ton loads and an 8-in. dia x 12-ft. Nitralloy boring bar driven by a 75-hp ac motor are features of this 8-in. planer-type horizontal boring, drilling and milling machine. With continuous bar feed of 84 in. and column cross travel of 10 ft, a tool can be fed 17 ft horizontally or 12 ft vertically in this 175-ton machine.

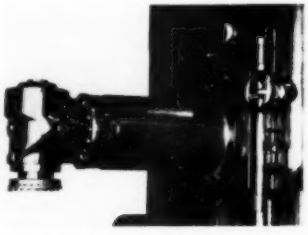
Control

Three levers selectively control 24 bar speeds from 2 to 400 rpm. Two levers are range selectors, the third a speed selector which may be operated without stopping bar or motor. Thus six speeds may be obtained in the preselected one of four ranges without throwing out a clutch or "feeling in" gears. The minimum range is 2, 2.6, 3.2, 4, 5.3 and 6.4 rpm; the maximum 131, 164, 200, 262, 327 and 400 rpm.

Two variable-voltage feed motors are used, one for feeding and traversing the table (through the Gray spiral-pinion angle drive like that on planers), the other for the column base, head and bar. Rheostats are motor operated.

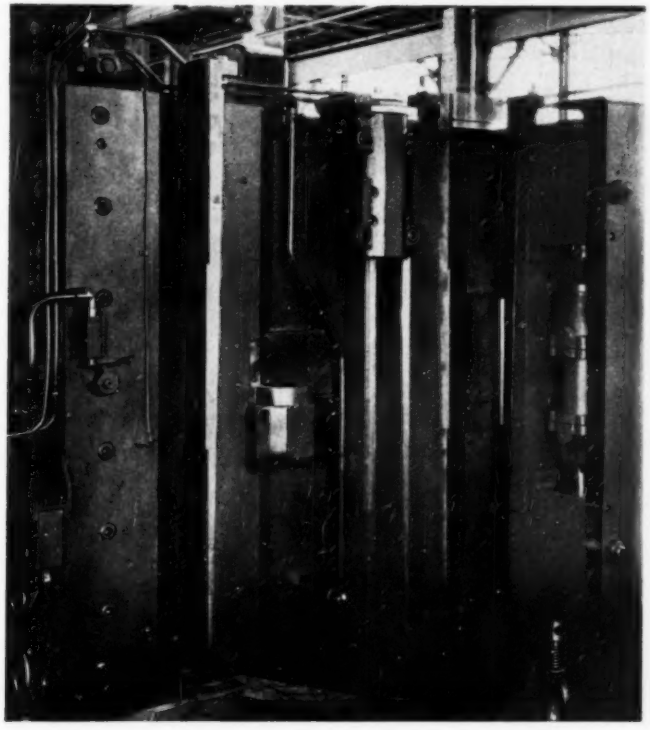
While of extremely sturdy design to handle the loads, the machine is characterized by simple control and ease of obtaining desired feeds and speeds. Controls for head, column, bar and table are centralized on a pendant switch, universally mounted and counter balanced on anti-friction supports so it can be used from any position on the face of or above the table. Controls are provided for starting, stopping, jogging and regulating speed of the variable-voltage motors; selector switches for clutch engagement and hydraulic clamps on the various units. Controls for the spindle motor are also on the pendant station, as well as direct-reading tachometers.

Only elements on the head are indicating lights, a wattmeter on a swivel to give a visible indication of



Right-angle Head . . . Among attachments is this heavy-duty saddle-type right-angle attachment which bolts to the head and has 48-in. reach to the cutter center. The head may be swiveled the full 360°

Materials and Parts



Behind the Head . . . Guiding surfaces and gib facings are covered with Formica to avoid scoring and scratching. Lubricant pump at bottom center provides one shot before head moves, others every 18 in. of head travel

power being used, the selectors for bar speed, a cutout switch under the platform to disengage the end support feed when it is not needed, and the bar-feed indicator. A 12-in. dial with movable metal clips enables the operator to gage bar feed distance to sixty-fourths and a handwheel splits this into thousandths.

The head itself weighs 12 tons and is counterbalanced by two weights suspended within the column by twin chains to insure balance without cocking regardless of bar position. The bar itself is 12 ft long, so at least 5 ft are in the head when the bar is at maximum extension. A platform for the operator travels with the head and is reached by a ladder built on the column. Vertical synchronized travel of the head and end support is 12 ft above the table.

A frog's-eye light in the face of the head above the bar can be set to suit the work. Head and end support have non-metallic ways and built-in lubrication that provides a shot of oil before any movement and spaced shots thereafter.

Basic Elements

While the basic parts of the machine and the table are castings the column and end support are fabricated of 1¼-in. steel and are of constant cross-section to avoid possible variation in deflection in vertical feed. The table is supported on two vee and two flat non-metallic bearing ways, and driven by a spiral pinion drive meshing direct with the rack for smoothness and designed to be self-locking under all conditions. This pinion, as well as

...INCLUDING

Thread-rolling machine for pipe threads has manual or semi-automatic feed. Takes pipe to 2-in. dia.....page 148

Automatic shear, 48-in. capacity, has roll feed adjustable to feed 6 to 120 in.....page 149

Shaper with 8½-in. cut has six automatic feeds in either direction. Speeds are 35 to 180 strokes per min.....page 150

Drillhead clutch with automatic release makes nut setter of single- or multiple-spindle drillheads. Torque can be preset....page 156

Rotating scanner for induction hardening of shafts and pins is continuous automatic machine. Magazine fed.....page 158

Arbor press powered by double-acting air cylinder assembles fragile parts. Power thrust is 20 times air-line pressure...page 160

Continuous tinning of wire strands at 150 to 500 fpm is possible in special machine. Takes wire gages 4 to 20.....page 162

...and in Sept. 22

Stainless steel in new grade requires only low-temperature (850 to 1000 F) hardening treatment. It has high hardness and good fabrication characteristics.

Lapping machine for production runs has continuous self-conditioning of the lapping plate for accuracy to 0.000016 in.

Power bender forms intricate bends in metal molding and tubing. Both manual and automatic operation.

other feed pinions, are 2-part units to permit adjustment to eliminate backlash. The pinion is lapped into the rack.

Column and Runway

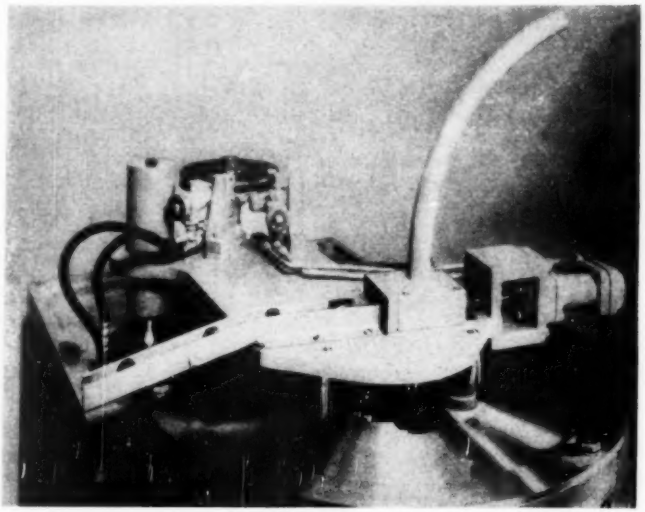
The runway has three flat ways, and is wide, deep and heavily ribbed to support the column rigidly. It is provided with closely spaced leveling screws. The middle way forms a long, narrow guide with non-metallic guiding surfaces, solid on one side, gibbed on the other. In addition, a bore-aligning device, consisting of three anti-friction rollers under adjustable spring pressure against a hardened steel runway, maintains constant contact against one side of the guide. This assures smooth, straightline motion of the 80-ton column when the column (rather than the bar) is fed in boring. Ways are covered by heavy-gage formed-steel covers on rollers, extending under the bed and with Formica buttons between covers and ways, so the operator may walk on them or a crane hook hit them without fear of damage to the ways. Column feed or rapid traverse of 10 ft along the runway is provided. The Gray "Electronic Woodpecker"—a solenoid-actuated weight—allows the column and other units to be set within 0.00025 in. despite their weight.

The machine bed is provided with five lines of closely spaced leveling screws. To clamp the table in any desired position, a separate dovetail has been machined on the lower surface. Raybestos-lined wedges grip this to pull the table down and hold it. The dovetail beneath the table is thus protected against oil.

The table has an outboard coolant drain channel attached. End-support movement of 3 ft is provided and vertical travel of the end-support bushing can be synchronized with that of the head. The end support bushing will be bronze in steel and the housing will not be bored until the machine is installed at the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, where it will be used to machine castings weighing up to 180,000 lb. Separate micrometer adjustment is provided between the end support and its lifting screw.

Included in tooling for the unit are an indexing table, a right-angle milling head, and a 60-in. dia. continuous-feed facing and boring head. The 7x8-ft. indexing table, capable of supporting 85-ton castings, has non-metallic bearing surfaces and is graduated the full 360°. Mounted atop the regular table, it will reduce the number of setups for a given job. Precision angular setting by push-button is provided, and settings can be read on a dial indicator protected by disengagement during rapid rotation. The right-angle milling head can be rotated 360° about its 48-in. neck, which bolts to the machine head and is driven by the bar. The facing and boring head has a solid cast face and guides for the cross slide. Feed rates can be adjusted as required.

The G. A. Gray Company, 3611 Woodburn Ave., Cincinnati 7, Ohio.



Pipe Threads Handled with Reed Thread-Rolling Machine

Thread rolling of pipe threads with this cylindrical-die thread roller produces accurate forms. They are available in accordance with standard NPT specifications, Army-Navy Aeronautical specifications AN-P-363, or Dryseal NPTF specifications.

Thread rolling is a cold forging process that forms the thread by displacement of metal, thereby saving material and providing a thread of increased strength. Thread form with burnished finish is obtained through use of three precise cylindrical dies.

The Reed Model A22 and A23 machines may be supplied with either manual or semi-automatic feeds suitable for rolling 1/16- to 2-in. pipe threads from 300 to 1500 per hr. Machines can handle pipe plugs and fittings made from miscellaneous steels (including stainless), brass, bronze and aluminum.

Work blank is supported and positioned between three synchronously rotating cylindrical dies. The three dies act on the blank simultaneously and hold it rigidly in proper rolling position. The dies always remain in match during rolling. Feed is by means of cam-actuated toggles, insuring definite and controlled rate of penetration, predetermined length of dwell, and positive duplication of size.

Model A22, illustrated, is arranged with a semi-automatic feed for pipe plugs. Unthreaded plugs are fed into the tube by the operator and the rest of the cycle—including loading the work into the dies, threading, and unloading, is automatic.

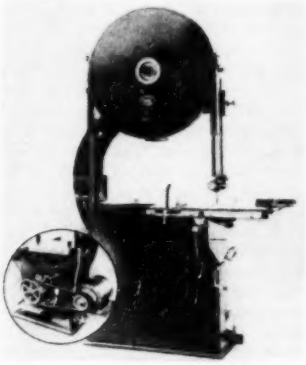
Reed Rolled Thread Die Co., Worcester, Mass.

New Valve Installation Centered Around Full-Flo Master Valve

Increased production is claimed with this type of valve installation centered around the new Full-Flo master valve. Instead of the conventional mounting of a four-way valve at some distance from the cylinder, this method places three-way valves, one normally open and one normally closed, at each end of the cylinder. Operation is effected by a conven-

iently located small pilot valve which can be manually, mechanically or electrically actuated. Arrangement permits elimination of long lengths of large-diameter pipe between valve and cylinder which had to be filled and exhausted with non-productive air. Mounting method is especially advantageous with valves of ¼ in. or larger or with smaller sizes where increased operating speed of the valve is required.

Ross Operating Valve Co., 120 East Golden Gate, Detroit 3, Mich.



Metal-Cutting Bandsaw Gives Speeds from 150 to 1200 rpm

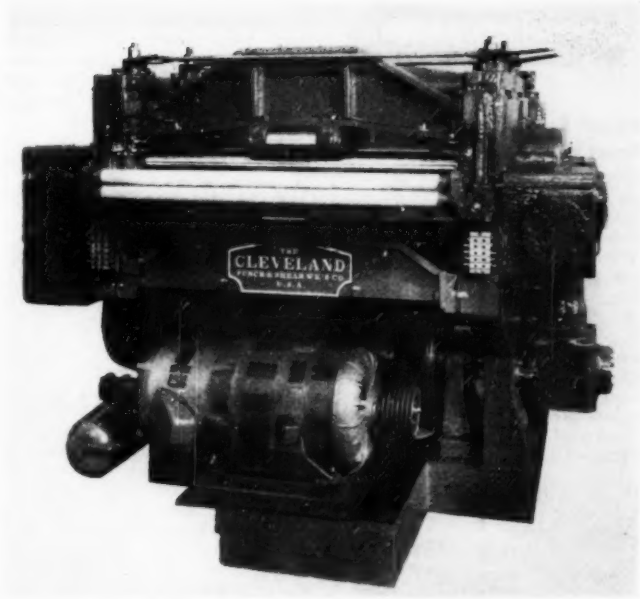
This high-speed bandsaw with heavy-duty 4-speed transmission is for cutting metals and alloys and gives a choice of operating speeds from 150 to 1200 rpm. Prelubricated and factory-sealed bearings are installed on wheels and motor, eliminating the need for periodic lubrication of the machine.

The Moak Machine and Tool Co., Port Huron, Mich.

Hammond Air Backstand for Heavy Grinding with Belts

The Model 3-A air backstand is designed for heavy production grinding or polishing with abrasive belts. It has an air-actuated cylinder which automatically maintains correct belt tension, compensating for a fraction of an inch of belt stretch. Different pieces of material require different belt tensions. After correct tension is determined, operator sets pressure-regulator valve. Model 3A is of heavy cast-iron construction except for stainless steel 12-in. dia 1-in. face idler pulley.

Hammond Machinery Builders, Inc., Kalamazoo 54F, Mich.



Automatic Shear With Roll Feed Operates at 60 Strokes per min

This 48-in. automatic shear with roll feed has a capacity of 48 in. of 1/16-in. steel, Rockwell 90 B scale. Shear which is equipped with an electrically controlled positive jaw clutch, operates at 60 strokes per min. Due to time delay in feeding stock, the number of cuts depends on feed.

Roll feed consists of five straightening rolls and two sets of pinch rolls, and is arranged with an electrically controlled Cleveland drum-type clutch. The feed on this machine operates at 120 in. max, and 6 in. min, at the speed of approximately 200 fpm.

The Cleveland Punch and Shear Works Co., Cleveland 14, Ohio

←

Rolling Maintenance Tower Raised Hydraulically

This rolling maintenance tower is raised hydraulically and operated manually by one person from a work platform. Safety brakes lock wheels to hold lift tower in desired working position. Unit telescopes to clear low, narrow doors. With the Safway Hydro-Lift, work may be performed at any platform level from 7 to 17 ft above the floor, permitting workers to reach equipment as high as 22 to 23 ft. An integral tubular steel ladder with hand rail provides easy access to the work platform when the platform is in its retracted position.

Safway Steel Products, Inc., Milwaukee 13, Wis.

Rotary Actuator Is Electrically Powered Right-Angle Type

This Rotorac electrically powered right-angle type rotary actuator has been redesigned to incorporate increased power rating, decreased weight, built-in radio noise filter, optional position-indicating transmtter and adjustable center-position switch for indicating or seeking. It is a reversible geared motor magnetically braked with a right-angle power take-off and provision for controlling the number of shaft revolutions beween desired limits.

Airborne Accessories Corporation, Hillside 5, N.J.

Logan Shaper Has 8½-in. Stroke Max, Handles Work 8-in. Long

This 8-in. shaper has a powerful 8½-in. max stroke permitting full and accurate machining of work 8 in. long. Straight cuts, angular cuts, squaring, machining and slotting are handled. Shaper has six automatic feeds in either direction, from 0.002 to 0.012 in., which are set by a feed dial with readings graduated to 0.001 in. A half turn of the feed handle in either direction reverses the feed. Any speed from 35 to 180 strokes per min is quickly obtainable and speed changes are effected by turning a handwheel control. The large table, 8 in. wide by 8 in. long, has a vertical travel of 5½ in., and a 10½-in. traverse.

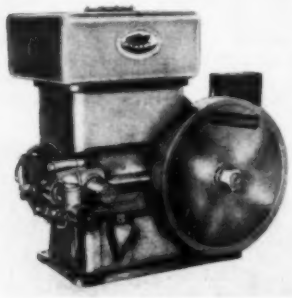
The adjustable table support mounted on the base of the machine provides solid reinforcement and assures extra capacity on heavy cuts without chatter or vibration. Because the toolhead may be swiveled 360°, squaring the ends of stock of almost any length is possible.

The Logan Engineering Co., 4919 West Lawrence Ave., Chicago 30, Ill.

Core-Drill Cutter Comes In 25 Sizes from 1½ to 3 in.

Available in 25 different sizes from 1½ to 3 in. diameter, this core-drill cutter of high-speed steel will remove approximately 45% of its diameter—ie, the 3-in. cutter will enlarge a 1⅝-in. hole to 3 in. Only four holders are needed for the entire series of 25 sizes. New cutters are four-fluted and can be fed twice as fast as a two-fluted twist drill. The short length of cutter and counterbore drivers eliminates excessive overhang, giving increased rigidity for precision work.

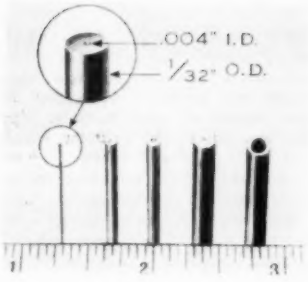
Scully-Jones and Co., 1902 South Rockwell St., Chicago, Ill.



Water-Cooled Engines Have Single Cylinder, Four Cycles

Addition to the Cub line of single-cylinder four-cycle horizontal, hopper-type, water-cooled engines is the Model R-40 which has a 56.6-cu in. displacement and develops up to 34 ft-lb of torque and 6 hp over its operating range of 700-1000 rpm. It is fully inclosed and self-lubricated, can operate on distillate, tractor fuel, gasoline, natural gas or kerosene.

Cushman Motor Works, Inc., Lincoln, Nebr.



Cemented-Carbide Tubes Extruded by Kennametal

Cemented-carbide tubes as small as 1/32-in. OD with an ID of 0.004 in. and as large as 9/16-in. OD with a wall thickness of 1/16 in. are being manufactured by extrusion methods. The OD is rough extruded, 0.010 in. to 0.015 in. oversize, and the ID is held to ± 1% of specified size and accurately concentric. Ratio of ID to OD may cover a wide range. Tubes can be supplied in either of two classes of Kennametal. One is straight tungsten carbide, having the high hardness common to this material combined with unusual strength. The other is essentially titanium carbide, having a hardness comparable to tungsten carbide, but its weight is much less. Distinguishing property is that it withstands corrosion and abrasion at elevated temperatures that rapidly disintegrate cast alloys.

Kennametal Inc., Latrobe, Pa.

Standardized Solid-Carbide Blanks Offer Increased Length

An improved line of seven sizes of standardized solid-carbide blanks for lathe and grinder centers range in price from 70 cents to $9.30. Length of the new center blanks have been increased. A new size has been added to the list— CT-140 having a length of 1⅜ in. Center blanks range in diameter from 0.250 to 0.875 in. Blanks are now ground to a tolerance of −0.000 and −0.0002 in. on the diameter.

Carboloy Co. Inc., Detroit 32, Mich.

Packaged Zinc-Base Die-Cast Rod

Latest packaged All-State product is the No. 53 Zinc-base die-cast rod which is now available in a 1-lb tube. Label on sturdy, metal-ended tubes gives complete instructions for most effective use of rod.

All-State Welding Alloys Co. Inc., White Plains, N.Y.

AMERICAN PHILLIPS SCREWS

Play "close harmony" with musical instrument makers in <u>both</u> these vital ways...

1. "Sweet Music" in Production: Never a "sour note" of spoilage, delay or accident where these automatically straight-driving American Phillips Screws are used in assembly. Costly materials and hours of skilled workmanship are never wasted or lost. To the contrary, American Phillips Screws combine speed with precision so that *fastening time is cut 50%*, even on the fussiest work.

2. "Sweet Music" in Promotion: American Phillips Screws are "grace notes" in their clean, modern appearance on musical instruments and all other products...a signature of quality on the surface that certifies the quality within. Wherever you find American Phillips Screws, you find a product that sells well *and stays sold.* Write.

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: 589 E. Illinois St. Norristown, Pa. *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Flex-a-Foam Filter Mask Protects Against Non-Toxic Dusts

This Flex-a-Foam filter mask features lightness of weight, exceptional toughness and toxic-free purity. The polythene frames can be additionally shaped by the heat of the hand to conform to individual facial contours. This feature gives air-tight, snug-fitting comfort. There is claimed to be virtually no wear-out. Filter is a honeycomb construction of whipped foam latex ventilated by hundreds of tiny, interconnecting air cells. Mask is said to filter non-toxic nuisance dusts as small as 1/25000 in.

The Goggle Parts Co., Inc., Cleveland 13, Ohio

General-Purpose Electrode for High-Alloy, High-Carbon Steel

General-purpose electrode, developed for maintenance and production work on special steels of the high-alloy and high-carbon types, listed as All-State No. 252, has a tensile strength of 85,000 to 95,000 psi. It is corrosion resistant and wear resistant, and is used in welding low-alloy steels without pre-heat and subsequent heat-treat. It is also used in joining dissimilar steels as well as building up case-hardened parts and welding clad steels.

All-State Welding Alloys Co., Inc., 273 Ferris Ave., White Plains, N.Y.

Feed Ring Series Cylinder Has Interchangeable Mounting

Low-cost Feed Ring series cylinders offer a variety of interchangeable mounting brackets. Aircraft O-ring packings allow inexpensive replacement of parts subject to wear. A unique locking principle eliminates threading of head to tube. Heads fit into the tube. Locking wire is fed into head as the latter is rotated clockwise, and subsequent piping of pressure line into the head through tube opening anchors both parts securely. Cushion and non-cushion models have identical over-all dimensions and all parts shown are interchangeable between the two models except the piston. Model comes in 2-, and 3-in. bore diameters. The non-cushion Feed Ring cylinders are available in 1½-, 2-, and 3-in. bore.

Modernair Corp., 4222 Hollis St., Oakland 8, Calif.

C-O-Two Fire Extinguisher Is Dry Chemical Type

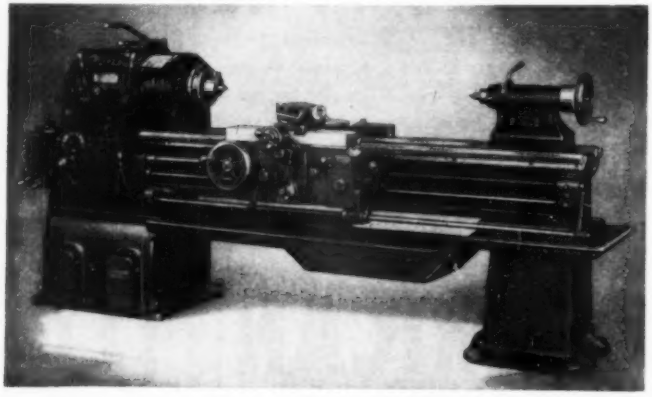
This C-O-Two dry-chemical-type fire extinguisher is a self-contained unit. It is free flowing and has no syphon tubes or valves within the cylinder to become clogged or inoperative. Discharge hose and nozzle remain empty until fire extinguisher is actuated. Two convenient sizes fit fighting needs, 20-lb capacity and 30-lb capacity. C-O-Two dry chemical is non-conducting, non-corrosive, non-freezing and non-toxic and is effective on flammable liquid and electrical fires. On-the-spot recharging of the extinguisher requires no special tools.

C-O-Two Fire Equipment Co., P.O. Box 390, Newark 1, N.J.

Gonser Grizzly Lifter Eliminates Chains, Slings

This multi-purpose non-slipping Gonser Grizzly Lifter, is an all-jobs lifter for handling bulky and awkward materials and equipment in machine shops, etc. Tool eliminates use of chains, ropes, slings, pinch bars and C-clamps. Lifter bar is calibrated in inches and is available in various lengths. The non-slipping lifter bar deflects when material is lifted, creating a tenacious clamping or gripping action of the jaws, unbreakable until the job is in position and lifting pressure on the bar is released.

Pucel Enterprises, Inc., 3756 Kelley Ave., Cleveland 14, Ohio



16-IN. LATHE of improved design is built to operate at spindle speeds to 1080 rpm. It is equipped with anti-friction bearing headstock, gear box, apron and quadrant. Gear box furnishes 63 changes of thread, lead, or feed, including 11½ and 27 tpi. All gears in box are heat-treated alloy steel with shaved teeth —*The Boye and Emmes Machine Tool Co., 125 Caldwell Drive, Hartwell, Cincinnati 15, Ohio*

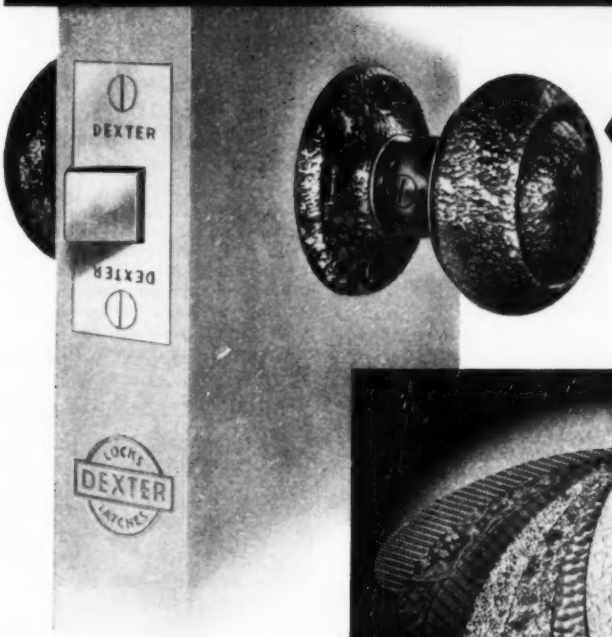
Electric Motor-Driven Dual Valve For Elevated Temperature

This 36x8-in., 150-lb Class B steel dual valve operates at a temperature of 1000 F. Body casting is chrome-molly steel. Powered by separate electric motors, each alloy-steel vane is operated independently of the other insuring close control of volume and pressure. Designated as valve No. 725, it is designed for either a high-pressure drop and small volume, or a low-pressure drop and large volume. It is available in all materials, in various combinations of sizes and for higher operating pressures.

R-S Products Corp., Wayne Junction, Philadelphia 44, Pa.

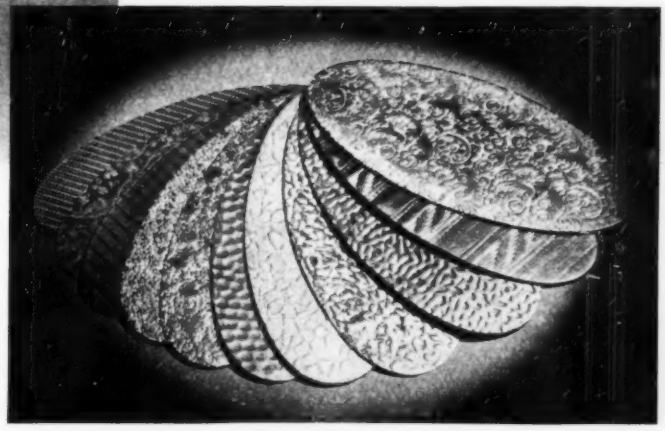
REVERE EMBOSSED METAL ADDS TO BEAUTY

of Solid Brass Hardware



A Dexter set made by National Brass Company, Grand Rapids, Michigan; in the lifetime beauty of solid brass. Knob is fabricated from a Revere Embossed Pattern.

Inset, some embossed patterns produced by Revere.



Quality hardware for homes and commercial buildings always is solid brass or bronze. There are no substitutes for these solid, ever-lasting metals that cannot rust, whose beauty is not skin deep but goes all the way through. Thus time and use improve the finish instead of spoiling it. That is why good buildings everywhere feature solid brass and bronze for such items as locksets, door knobs, butts, latches, hangers, hooks, and similar parts that should speak of quality as long as the building stands.

Take the National Brass Company. This well-known hardware manufacturer features solid brass 100%, knowing that any architect, builder or home owner recognizes the worth of enduring high quality. Their line is trademarked "Dexter", and one of its feature items is trim in etched finish. Actually these items use solid Revere Embossed Brass, which is furnished in a variety of standard and special patterns, ready for fabrication into articles of exceptional attractiveness, not only hardware, but also a wide range of products such as compacts, clock dials, cigarette cases, jewelry. National Brass states that Revere Embossed Brass not only produces a really handsome line, but one whose beauty increases with age, since use brightens the high-lighted raised surfaces, while the shadows in the depressions provide an effective contrast. Thus this fine Revere Metal assures lasting satisfaction to the home owner, and enhances the reputation of the architect, contractor, and builder. . . . For true quality, high sales appeal, and enduring service, wise manufacturers use solid durable metals such as copper, brass, bronze, nickel silver provided by Revere not only in Embossed Metal but in plain sheet and strip and in bar, rod, extruded shapes.

REVERE

COPPER AND BRASS INCORPORATED

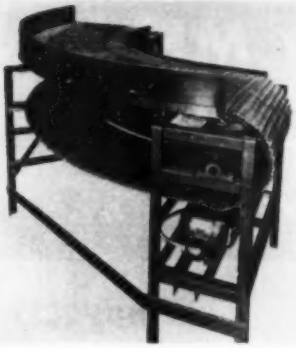
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

* * *

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.

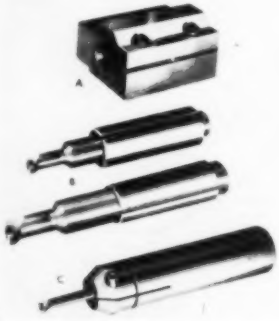
Sales Offices in Principal Cities, Distributors Everywhere.



Powered Flat Conveyor Travels Around Desired Curve

Utilizing a conveyor chain, a balanced-weave wire mesh belt is guided around practically any curve, producing a powered flat conveyor. Wear on edges of wire mesh belts is eliminated because they do not drag against guides. The Leeds Flat-flex conveyor may be used in conjunction with other flat conveyors, or the entire conveyor including straight and curved runs, may be made continuous.

The Leeds Electric & Mfg. Co., Hartford, Conn.

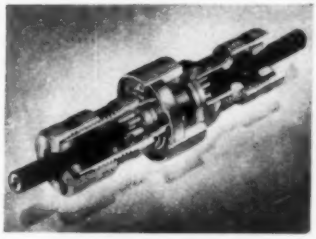


Bokum Holder Designed for Single-Point Boring Tools

Holder, A, designed for single-point boring tools on lathes has a theoretical range of diameters from 1/16 to approximately 4 in. with the aid of shanks and adapters. Holder, BT-24, has a 1½-in. bore to accommodate the shanks and adapters which are used to hold the smaller tools. Split bushings, B, with 1½-in. OD, and 1-, and 1¼-in. ID, are provided for use of Bokum tools Nos. 4 to 12 to give a boring of minimum diameters from 11/16 to 2 in.

An adapter C (B-1244) of 1½-in. OD accommodates tools Nos. 00000 to 3 which have a ⅜-in. shank, and theoretically will give a minimum diameter range from 1/16 to 9/16 in. Shanks of three different diameters with threaded ends are provided for the attaching of separate cutter heads, Nos. 4 to 12. Centers are provided at each end of the shank to enable you to turn down the neck to any desired size for any practical length required.

Bokum Tool Co., Detroit, Mich.



Quick-Disconnect Electrical Coupling is Waterproof

This quick-disconnect electrical coupling for all-weather and submarine application is known as the 1600 series. It is a quick-acting, heavy-duty type, impervious to moisture and capable of withstanding long periods of complete immersion under high external pressure without leakage.

Roylyn Inc., 718 West Wilson Ave., Glendale 3, Calif.

Filter Aid for du Pont High-Speed Copper-Plating Solution

A filter aid approved for use with the du Pont High-Speed Copper Plating solution is available under the trade name Solka-Floc. Aid is precoated from aqueous slurry and then washed in place in the filter by circulation of hot water for about one hour prior to contact with the plating solution.

Brown Co., 500 Fifth Ave., New York 18, N.Y.

Single-Connecting Pin Design On Double Roller Chain Couplings

This single-connecting pin design for Morse series DRC stock double-roller chain couplings is said to increase ease with which couplings can be assembled and disassembled. Couplings are made in seven sizes ranging in capacity from 2.7 to 97.0 hp per 100 rpm with a wide range of finished bores available.

Morse Chain Co., 7601 Central Ave., Detroit 8, Mich.

Matco All-Angle Precision Vise Has Screw for Fine-Angle Setting

Cradle of this all-angle precision vise has a 90° range, 45° each side of horizontal. Sizes are 3½-and 4½-in. width of jaw. Base swivels 180°-vertical setting to 90°. Vise is used for drilling, counterboring, tapping and reaming operations. Vise features a screw for fine angle setting.

Matco Tool Co., 2830-36 W. Lake St., Chicago 12, Ill.

Lapping, Testing Micrometers

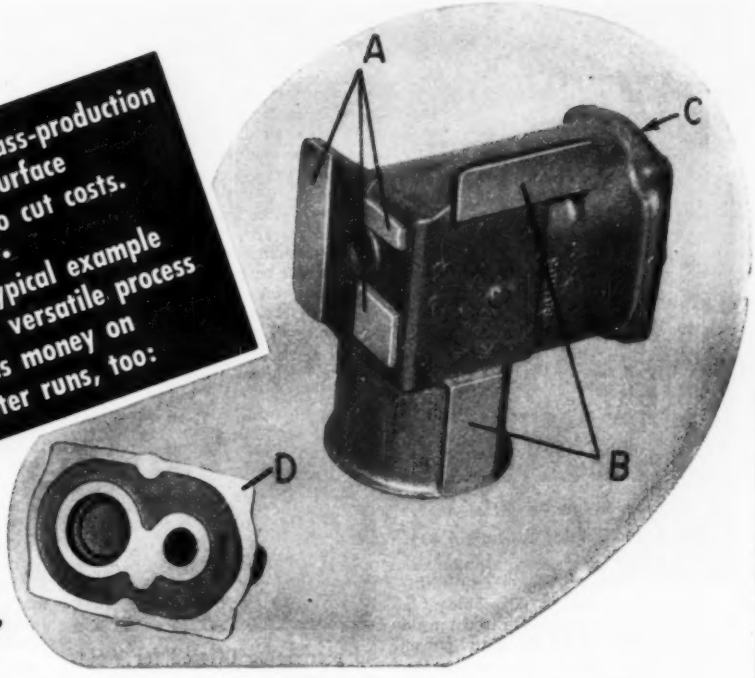
This lapping and testing kit No. 45 permits machinists and toolmakers to maintain original accuracy of their micrometers. Kit 45 handles micrometers with a range of from 1 to 2 in., and makes it possible to lap the micrometer anvil and spindle surfaces flat and square with the axis of the screw within 0.00001 in. Kit consists of one, 1.000 in. x 1¼-in. dia double-surface lap accurately flat and parallel within 0.000005 in.; one, 1.0125 in. x 1¼ in. dia double-surface lap accurately flat and parallel within 0.000005 in.; one, 3/16 in. and ¼ in. ball tester, and 2 drams of finish lapping compound.

The Van Keuren Co., 176 Waltham St., Watertown, Mass.

You don't need mass-production to use surface broaching to cut costs.

•

Here's a typical example of how this versatile process saves money on shorter runs, too:



How to cut Machining costs on castings

Shown here are two of **three different castings** requiring the machining of **14 surfaces.** The 3rd casting is similar to the larger one.

All surfaces on all three castings are broached on just **one machine**—a Colonial Dual Ram—with a total of **only two broaches,** one for each ram.

Sure a setup like that cuts costs:

Machining time per face is measured in seconds instead of minutes;

One ram returns and is being loaded while the other is cutting;

Tools have to be removed only rarely for sharpening;

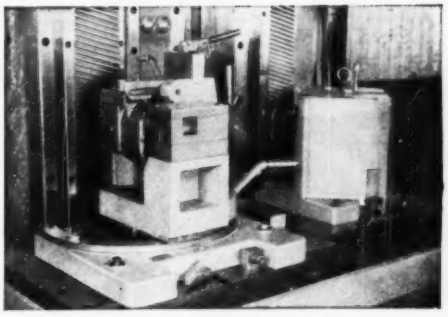
A simple fixture index eliminates extra set-ups;

Tolerances are accurately and automatically held;

In-and-out shuttling of the fixtures is automatic;

Adjusting screws on fixtures allow for unusual stock variations.

Of course your jobs may require a different type of surface broaching set-up—say on a Single Ram machine (with one broach); or on a Universal Horizontal. Regardless of the best machine type, the odds are Colonial can show you some real savings on machining of castings. We will welcome the opportunity.

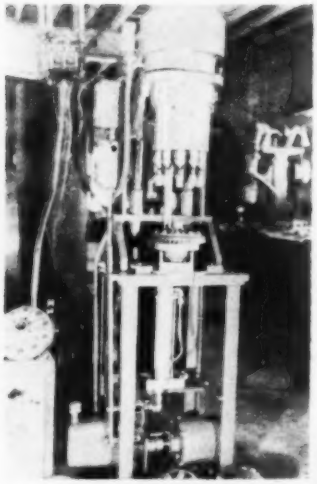


What would you like to know about broaching? Drop us a line. We'll be glad to help . . .

PIONEERS OF H.S.S. BROACHING

COLONIAL

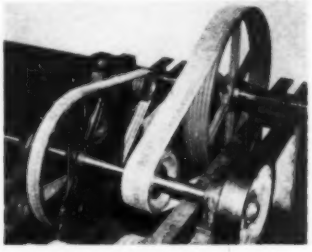
BROACH CO. DETROIT 13



Cam-Type Automatic Release Clutch for Single, Multiple Heads

This Tru Tork cam-type automatic release clutch for single- and multiple-spindle heads is adaptable as a nut runner or setter. Desired torque can be preset. Rotation of the power shaft causes instant disconnection the moment the preset torque is reached. Spindles with Tru Tork clutches are adaptable to existing air or electric tools. One machine can tighten 20 or more nuts or cap screws in one operation with each spindle preset to desired torque.

Clyde Tool Co., 1101 E. Eleven Mile Road, Route 1, Box 458-A, Royal Oak, Mich.



Vee Ply Belting Services Emergency Breakdowns

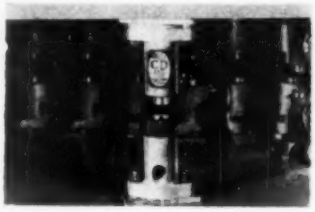
Vee Ply belting designed to service emergency breakdowns and eliminate a large endless belt inventory can be adapted to most V-belt drive applications. It is easily uncoupled from roll stock as needed, and is adjustable to any length. It is designed and recommended for continuous heavy-duty service.

Worthington Pump & Machinery Corp., P.O. Box 953, Buffalo 5, N.Y.

Gairing Ful-Grip Micro-Nut Has 0.001 in. Graduations

This Full-Grip Micro-Nut is recommended for individual tool adjustment on multiple-spindle setups and may be used on threaded adapters and holder assemblies with or without keyways. Accurate adjustment is guided by 0.001-in. graduations. Setscrew does not bear against adapter threads. It gives a full grip on the threads all around by moving top and bottom parts in opposite directions, providing firm and parallel contact against end of machine spindle.

Gairing Tool Co., P.O.Box 478, Roosevelt Park Annex, Detroit 32, Mich.



Adapter Setup Offered for Wales Type CD Hole-Punching Units

This Type CD hole-punching unit is an adapter set-up method eliminating the necessity of large ground steel plates and accurate hole-drilling equipment. It is said to assure accuracy of hole location by mounting and permanently doweling Type CD hole-punching units to die set. Set-up permits use of units in combination with blanking and forming dies. Units punch round or shaped holes up to 1½ in. in diameter and ⅛ in. mild steel.

Wales Strippit Corp., North Tonawanda, N.Y.

Twin-Cyclone Dust Separator Has 4 1/2-cu ft Capacity

Twin-Cyclone dust separator No. 219 incorporates two cyclone separators of the same size, used in the Torit Nos. 18-FM and 19-FM Models. Cyclones are mounted on a common bottom reservoir which has a 20x28½ x15½-in. high pull-out drawer. Capacity is about 4½ cu. ft. Equipped with a 5-hp, 3450-rpm end-mounted motor, 8-in. inlet and 10-in. exhaust outlet, it develops 2100-cfm velocity, 6000-fpm. Static pressure is 3 in. Over-all height is 90 in. Width 35 in., depth 29½ in. Floor space required is 24x30 in.

Torit Mfg. Co., St. Paul 2, Minn.

Tracto-Loader Offers 10-cu ft Standard Bucket

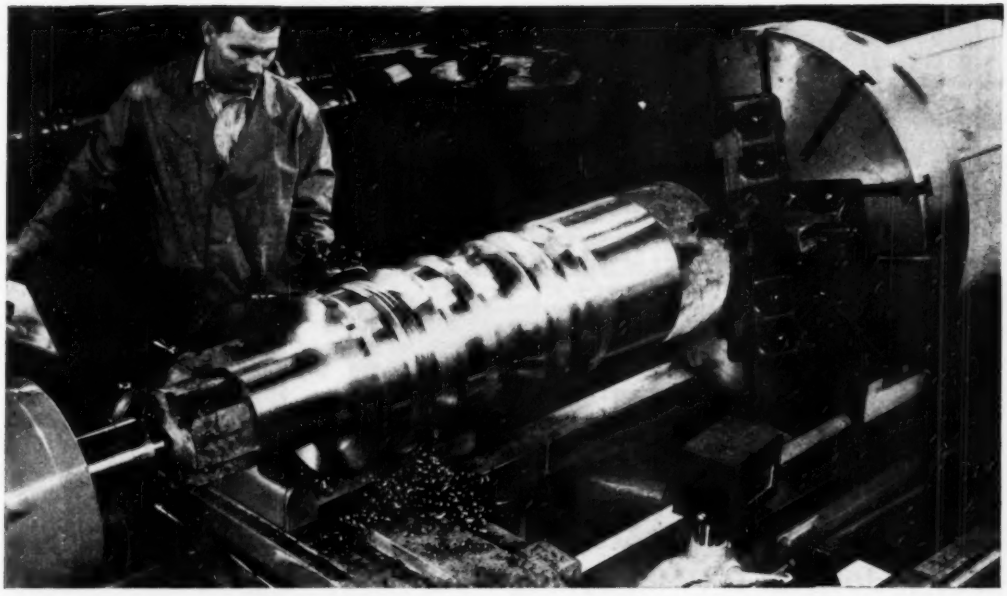
Model TL-B Tracto-Loader has a 10-cu ft standard bucket. Bucket is positioned over the driving wheels and the steering wheels in the rear. Loader has a hydraulically-controlled bucket that can be sumped in whole or in part to a height of approximately 5 ft. The bucket has a forward crowd action and an automatic tilt-back feature. Over-all length with bucket down is 9 ft 5 in. Over-all width, outside tire measurements, is 4½ ft, and wheel base is 4 ft 1 in. Brake horsepower is 27.8. The Model is designed to handle primarily bulk materials in congested areas where working space is small. It will go into a standard 6-ft wide box-car door without backing up or jockeying around.

Tracto-Motive Corp., Deerfield, Ill.

Doerr Bench Grinder Available in 1/4-, 1/3-hp Ratings

This low-priced grinder provides ample working area in front of the motor frame and in the space between the frame and inside of the grinding wheels. Wheel guards are removable for easy attachment of buffing wheels and other accessories. Standard equipment includes two 6x¾-in. grinder wheels. It is available in ratings of ¼ and 1/3 hp, at 3450 rpm. The motor is equipped with lifetime lubricated ball bearings. Hardware is cadmium plated.

Electro Machines, Inc., Cedarburg, Wis.



OF SPECIAL INTEREST TO STEEL PRODUCERS

MAJOR SAVINGS OF MONARCH'S NEW METHOD FOR TURNING ROLLS

- Floor-to-floor turning times range from *three to six times faster* on all types of rolls suitable for this new type of contour turning.
- The hundreds of form tools necessary for conventional methods of roll turning are not needed. Only standard carbide turning tools are used—a tremendous saving in tool inventory.
- Since forming of the contour is template-controlled, there is no need to match rolls in pairs. Each roll turned from any given template is identical. One of a pair can be redressed, or a new one turned with definite assurance it will match the other.

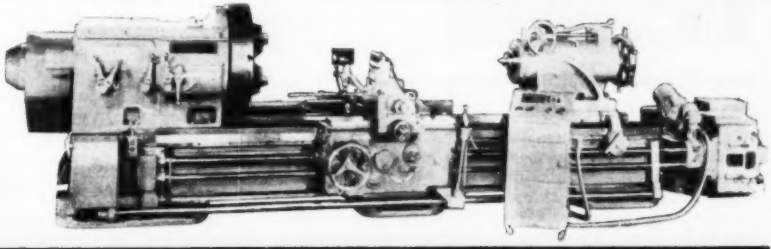
Announcing The New
Monarch Roll Turning Lathe

Now! You can contour turn steel mill rolls in one third the time —or less! It's done with the new Monarch template-controlled Roll Turning Lathe, available in two sizes, to turn rolls up to 102″ and 126″ long. Within these ranges the machine will turn an almost infinite variety of shapes on the roll face, and also will handle necks at the same setup.

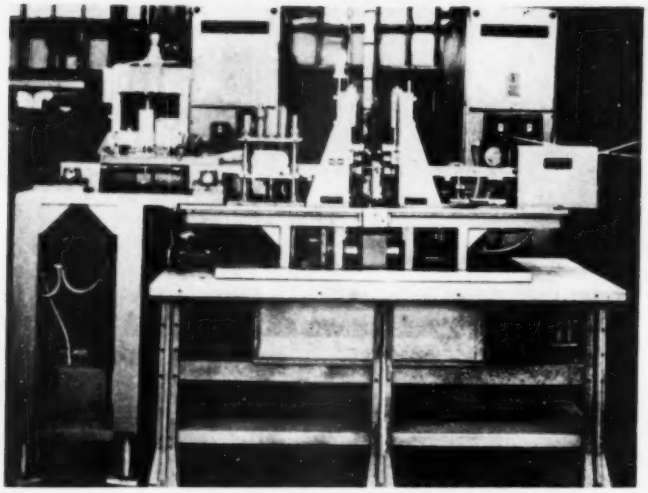
This revolutionary new time-saving, money-saving machine, based upon Monarch's twenty-year experience in pioneering the design of contour turning lathes, has been proved in use by exhaustive field tests extending over a period of more than a year. Now it is ready to go to work cutting costs in your shop. Better get the full facts without delay. Ask for booklet 1301.

THE MONARCH MACHINE TOOL COMPANY • Sidney, Ohio

ACCURACY · ECONOMY · LONG LIFE
Monarch
TURNING MACHINES



FOR A GOOD TURN *FASTER* —— TURN TO MONARCH

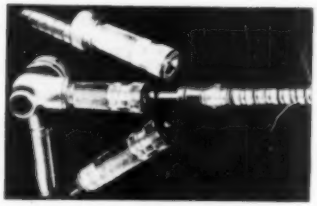


Horizontal Rotating Scanner For Industrial R-F Hardening

This horizontal rotating scanner is for the induction hardening of shafts and pins. The automatic machine requires manual refilling of magazine at 8-min intervals. The system consists of three major components: the automatic loding device, horizontal rotating scanner, and industrial R-F generator. The equipment hardens shafts by passing them continuously through an inductor coil and spray quench ring. A continuous process, this system minimizes materials handling by eliminating batch hardening.

Precision control of the R-F generator makes possible hardening of selected areas. Mounted above the worktable sink, the horizontal rotating scanner feeds the work at a controlled speed through the work coil and spray quench rotating the shifter rails about their common longitudinal axis as the rails move forward. Scanner can be used to harden a wide variety of cylindrical parts in any desired pattern. Machine can be adjusted to handle shafts 2 to 16 in. long and $\frac{3}{8}$ to 2 in. in diameter. Rate of feed is 0.76 in. per sec.

Westinghouse Electric Corp., Pittsburgh 30, Pa.



Quick-Change Handpiece Coupling Has Snap-on-or-off Action

This Wyco quick-change handpiece coupling offers quick snap-on-or-off changes made from a straight handpiece to an angle head or from a grinder to a sander, and then to a buffer or wire brush wheel, without loss of time. The snap-on-or-off feature comprises a sliding sleeve on the handpiece of the straight or angle spindle which locks four steel balls in an annular groove, thereby allowing the handpiece to swivel but not to unintentionally disconnect. It requires two hands to operate the unlocking sleeve which is a safety feature. The quick-change is now offered on all standard Wyco flexible shafts and machines as standard equipment.

Wyzenbeek & Staff, Inc., 883 W. Hubbard St., Chicago, Ill.

Microhardness Tester Applies Loads from 1 to 1000 g

Model MO Tukon microhardness tester is mechanically operated and recommended for light load testing where there is not sufficient testing to warrant an automatic model. It is made in both floor and bench models and applies loads of from 1 to 1000 g. It may be used with either the Knoop or 136° Diamond Pyramid Indenters. Load is applied under dash-pot control, speed of which may be varied from less than 0.040 ipm to as fast as testing permits without impact influencing results.

A special arrangement allows removing load without operator having to touch instrument until indenter is out of impression.

Wilson Mechanical Instrument Co., Inc., 230 Park Ave., New York 17, N.Y.

Spider-Type Spindle Simplifies Checking Large Shallow Holes

This spider-type Precisionaire spindle eliminates difficulties of cocking and sticking often encountered in checking shallow large-diameter holes which offer a minimum of bearing when the spindle is presented. It is used with the Precisionaire, a flow-type air gage for checking internal diameters, bell mouth, out-of-round, at the average diameters. It is balanced for rotational accuracy, and diameter-locating surfaces are faced with tungsten carbide for long wear.

Sheffield Corp., Dayton 1, Ohio

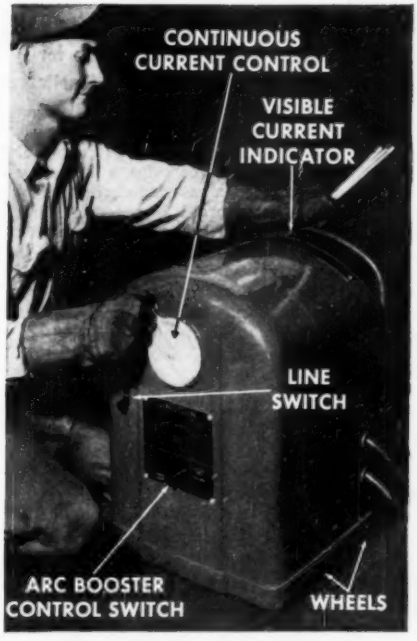
200-amp Arc Welder by Arico Is Portable and Self-Contained

This ac transformer arc welding machine known as the Wilson 200-amp max MCT is a portable welder designed for use by small shops, etc. It has a rated maximum output of 200 amp, is self-contained, and has a welding range divided into two ranges of current adjustment with stepless control throughout each range. Capacitors are supplied in the secondary circuit to provide easy arc starting and arc stability.

Air Reduction Sales Co., 60 E. 42nd St., New York 17, N.Y.

WORLD'S BEST BUY IN INDUSTRIAL WELDERS

New Lincoln "Fleetwelder" sells for only $180.00 ...uses 5/64" to 1/4" Rods



Lincoln Electric announces the New N.E.M.A.-Rated 200 amp.* Industrial Type "Fleetwelder." Selling at $180.00, the lowest price of any welder of its type, and proved on all kinds of jobs as the top performer of its class, this new Lincoln is the greatest value in the history of industrial arc welding. Based on maximum output *the price per welding amp. of capacity is only 56 cents* . . . a new low for all time.

Equipped with the famous Lincoln "Arc Booster" and other exclusive features, this new AC welder is unsurpassed in its field for *ease of striking, quality of welds, range of output, economy of operation, safety and compact design.* Portable on wheels at no additional cost.

With a N.E.M.A. rated range of 30 to 250 amperes and with over 25% extra reserve, the welder has enough current capacity for thousands of production lines and maintenance shops. For single-phase power, it can be used in any factory or shop.

Get all the information about this sensational new Lincoln . . . or better yet, ORDER YOUR "FLEETWELDER" TODAY! The handy order form below is for your convenience.

THE LINCOLN ELECTRIC COMPANY
Cleveland 1, Ohio

The New 200-amp. "Fleetwelder"
IDEAL FOR:

Metal Products Manufacturers	Structural Fabricators
Tool & Die Shops	Foundries
Maintenance Shops in All Industries	Automotive Plants
Sheet Metal Shops	Truck Fleet Repair Shops
	Job Welding Shops
	Garages

*N. E. M. A. Rating is your guaranty of a conservatively rated industrial AC welder.

ORDER YOUR "FLEETWELDER" TODAY!

FLEETWELDER ORDER FORM

The Lincoln Electric Company
Dept. 107, Cleveland 1, Ohio

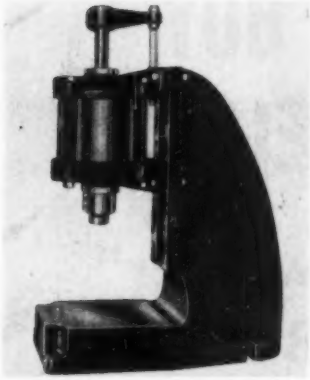
☐ Send full details on the New 200-amp. "Fleetwelder."

☐ Ship at once____200-amp. "Fleetwelders" at $180.00 each (accessories additional).

Ship via_____

Name _____ Address _____

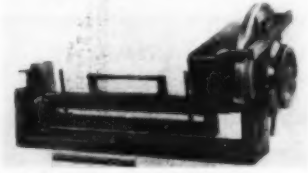
Company _____ City & State _____



Bellows Air-Powered Arbor Press Has Double-Acting Air Cylinder

This Bellows air-powered arbor press utilizes a specially designed double-acting air cylinder to provide full control of both the advance and retract strokes of the ram. The controlled air pressure enables press to be used for assembly operations involving fragile parts. Power thrust developed is approximately 20 times the air-line pressure applied. Press will operate on any air-line pressure up to a maximum of 175 lb. By means of a double-end piston, equipped with an adjustable locking collar, positive adjustment of stroke length from a fraction of an inch to a maximum of 2½ in. is obtained. Ram clearance is adjustable to four positions in units of 1½ in. with a maximum ram clearance of 7 in. Throat clearance is 5 in. Table size is 8x9 in. Four mounting holes facilitate bench mounting.

The Bellows Co., Akron, Ohio

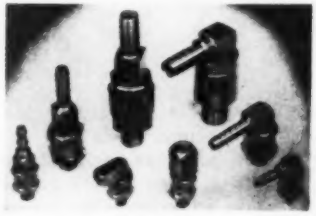


Rotating Member of Wheel Dresser Is Supported at Both Ends

This radii, tangent, and angle dresser for grinding wheels has the rotating member supported at both ends, giving the diamond a "between centers" support for accurate, chatterless dressing. Diamond is mounted inside a ball supported at both ends which provides clearance in dressing deep concave radii, and contributes to rigidity of support and accurate alignment of the diamond, particularly in dressing very small concave radii where the bar must be made slender where the diamond is set.

Rotation of diamond is effected by using the bar which extends across the face of the dial as a crank. Sidewise movement of diamond is effected by turning knurled knob. Adjustable stops arrest rotation at predetermined angular positions to hold rotor steady while dressing tangents and angles. Jacks are provided as aids in making fine adjustments when setting the elevation of the diamond.

Condenser Cleaners Mfg. Co., 1041 McCartney St., Pittsburgh 20, Pa.



360° Swivel Connectors Offered for Air-Powered Tools

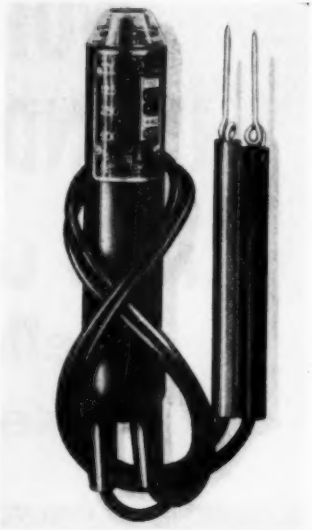
Line of air-tight swivel connectors are designed for use with all types of compressed-air-operated tools. When used at the air intake connection of air-powered tools, connectors provide a full 360° swivel action increasing operator efficiency and eliminating wrist strain and cramped hands. Swivel connectors are fabricated of rust-resistant steel, and can be furnished from stock in straight or "ell" types to fit hoses from ¼ to 1-in. in size and pipe from ⅛ to 1 in. in size.

The Cleveland Vibrator Co., 2752 Clinton Ave., Cleveland 13, Ohio

Worthington Rotary Pump Line Employs Mechanical Seal

A mechanical seal and a self-lubricating inboard sleeve bearing to carry overhung drives are employed in the improved rotary pump line known as GAMI. Seal and bearing assembly are interchangeable on the same shaft with the standard stuffing box of the GA type pump. Seal is subject to suction pressure only. The new line is designed for handling liquids comparatively free from abrasive or corrosive substances. Pumps can handle a considerable amount of air or gas in the liquid.

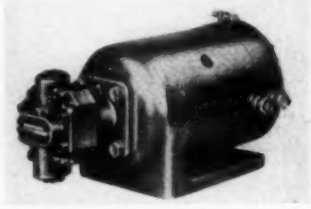
Worthington Pump & Machinery Corp., Harrison, N.J.



Magnetic-Type Polarity Cap for Voltage Tester Made of Plastic

This magnetic-type polarity cap for a voltage tester is made of transparent plastic and screws on top of the tester. It contains a two-color magnet on a rotating shaft. One of the tester prods is red, the other black. When the red portion of the magnet is up the red tester prod is positive; when the black portion is up, the black prod is positive. Cap contains no lamps or high resistive elements to burn out.

Square D Co., 6060 Rivard St., Detroit 11, Mich.

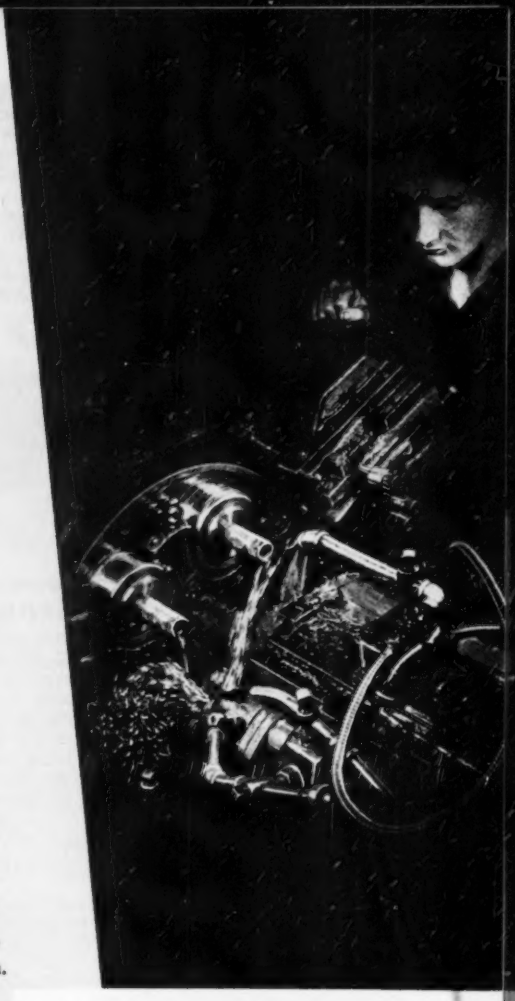


Barnes Pump and Motor Unit Mated to Each Other

Addition to the line of Constant-Flo rotary gear pump is a pump and motor unit which are exactly mated to each other, assuring maximum efficiency. The unit combines the specific model of the Barnes Constant-Flo rotary gear pump best suited to a customer's requirements with a special 12-volt series wound motor. Capacity is 2.5 gpm at 650 psi and 2.0 gpm at 1000 psi.

John S. Barnes Corp., Rockford, Ill.

NEW!
SUNICUT
812W and 817W



DUAL-PURPOSE CUTTING OILS FOR AUTOMATIC SCREW MACHINE WORK

THE NEW Sunicut grades have been thoroughly "Job Proved." Superlative results have been obtained on automatics machining all types of steel and brass at all practical speeds and feeds. These oils serve both as lubricant and cutting fluid. Their use eliminates the problem of cutting oil dilution. They are transparent, non-emulsifying oils compounded with Sun's revolutionary, all-petroleum additive, Petrofac. For further information, fill in and mail the coupon.

SUNICUT 812W is recommended for superior performance on high speed, multiple spindle automatics machining low-carbon steels, alloy steels and brass.

SUNICUT 817W is a higher viscosity oil for use on larger automatics machining all types of steel and brass. It is recommended for severe operations where heavier cuts are taken and higher temperatures maintained.

Sun Oil Company, Dept. AM-9
Philadelphia 3, Pa.

Please send me your informative booklet describing the excellent results being obtained in automatic screw machine work with Sunicut 812W and 817W.

Name _____

Title _____

Company _____

Address _____

City _____ Zone ____ State _____

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Toronto and Montreal

SUN PETROLEUM PRODUCTS

"JOB PROVED" IN EVERY INDUSTRY

SUNOCO

Sunicut and Petrofac are trademarks of Sun Oil Company

2000-lb Capacity Pallet Truck Handles Corrugated-Paper Pallets

Expendable 4-way corrugated-paper pallets having large cylindrical supporting columns can now be handled by a newly designed hand pallet truck.

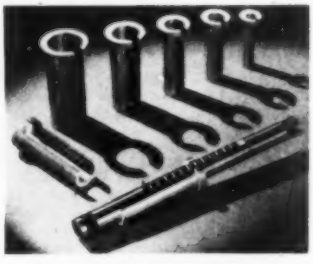
Capacity of this new truck is 2000 lb. It has a lowered height of 3¼ in. and an elevated height of 7¼ in. Truck will also operate in the standard double-faced wooden pallet.

Lyon Raymond Corp., 2141 Madison St., Greene, N.Y.

New Shapes in Carbide Cutters

M. A. Ford line of carbide cutters has been increased to over 40 standard shapes. These cutters may be used for filing, burring, grinding, finishing, countersinking, chamfering, light milling, profiling and tool, die and mold machining. Carbide cutters are said to outlast high-speed steel files and cutters 100 times.

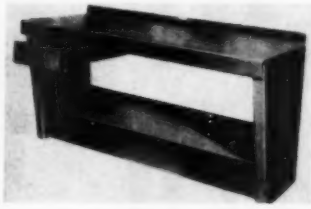
The M. A. Ford Mfg. Co., Inc., Davenport, Iowa



Eccentric Bushing-Type Adapters

This line of eccentric bushing-type adapters is developed for use with standard ⅜-, ⅝-, ¾-, 1- and 1¼-in. Glenny broaches. One size broach can be used to cut accurate keyways in six different diameter bores. For example a 1½-in. broach equipped with proper adapters can be used to cut keyways in 1⅜-, 1 13/32-, 1 7/16-, 1 15/32- and 1½-in. bores. Shoulder on the adapter prevents it from falling through during the cutting operation, and blade bending or breakage is eliminated by passing the entire broach through the workpiece. Adapters feature 0.005-in. accuracy and are fabricated of hard chrome-plated steel. They are available in sizes ranging from ½- to 2-in O.D.

Kase Machine Co., 18422 Buffalo Ave., Cleveland 19, Ohio



Streamlined Steel Work Bench Is 6 Ft Long, 34 In. High

This streamlined work bench has a 12-gage steel top and is made for heaviest industrial and automotive uses. Size is 6 ft long by 34 in. high and 28 in. deep. Legs are sloped back so that there is no stumbling. Electrical knockouts for double outlets are provided in the front of each leg just below top.

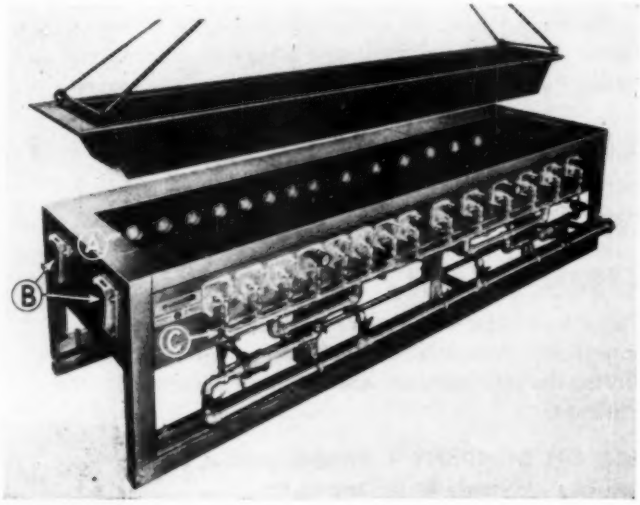
Equipto, Div. of Aurora Equipment Co., Aurora, Ill.

Series O and OE Valves Have 1/8-, 1/4-in. Pipe Connection

Small single-plunger valves known as Series O and OE, consist of an aluminum housing, a hollow stainless-steel plunger with precision placed parts, brass spacers accurately positioned end to end on each other, O-ring packers, and closing brass gland nuts and an aluminum push-button.

Valves are balanced and will remain in position until changed. They are furnished capped for either ⅛-or ¼-in. pipe connection, and are available in two-way, three-way open exhaust, three-way pipe exhaust, double two-way, four-way and five-way designs and with either push-pull or push and spring return actions. They are suited for use with air, oil or water at pressures to 125 psi maximum at normal temperatures. Class O valves have piped exhaust. The OE valves have an open exhaust and should be used with air only. Valves can be disassembled for repacking without disturbing the piping.

C. B. Hunt & Son, Inc., Salem, Ohio



MULTIPLE STRANDS OF WIRE are being tinned continuously in pots heated by radiant ceramic gas burners in furnaces. Wire gages from 4 to 20 are being tinned at production rates of 150 to 500 fpm. Air-gas mixing systems installed with the furnaces, regulate fuel supply for most complete and effective combustion. A is radiant ceramic gas burners, B, access doors, and C, gas burner manifold—*Selas Corp. of America, Erie Ave. and D Street, Philadelphia 34, Pa.*

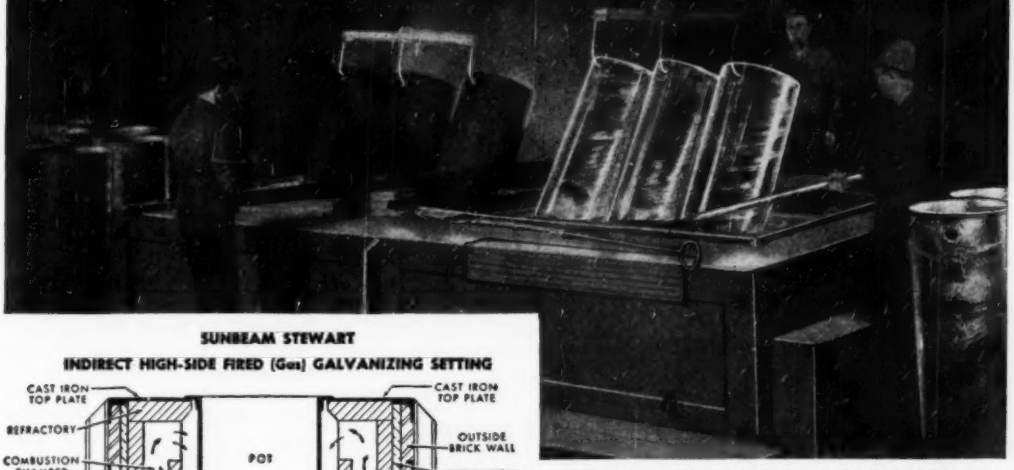
No. 95 of a Series of Typical Installations

Sunbeam STEWART

THE BEST INDUSTRIAL FURNACES MADE

GALVANIZING WATER HEATERS

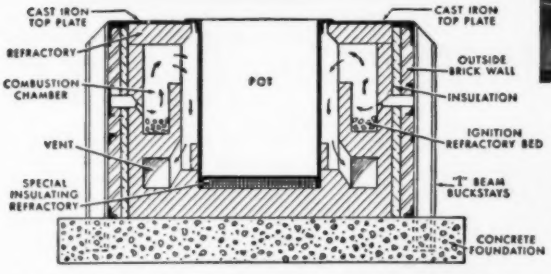
At A. O. Smith Corporation, Kankakee, Illinois, Works



Sunbeam Stewart Galvanizing Equipment at A. O. Smith is in operation 8 hrs. per day, plus, depending upon manufacturing schedules. 500 sets (shell, 2 heads, 1 flue) are processed per shift.

SUNBEAM STEWART

INDIRECT HIGH-SIDE FIRED (Gas) GALVANIZING SETTING



Improved design and correct engineering have made Sunbeam Stewart the leader for galvanizing equipment. Burners fire against a protective baffle and provide a uniform flow of hot combustion gases to the upper part of the kettle. The gases travel downward to a point slightly above the dross where they are exhausted. This principle of High-Side Firing provides close temperature control and even heat distribution. Available for gas or oil fuel. This type of design assures:

1. UNIFORM BATH TEMPERATURE
2. LOW DROSS LOSS
3. MAXIMUM PRODUCTION RATE
4. LOW FUEL CONSUMPTION
5. LONG KETTLE LIFE

This is Number 95 in a series of typical installations showing how Sunbeam Stewart furnaces are helping manufacturers reduce their costs and keep themselves competitive. These installations also demonstrate the wide variety of specific requirements in the metal-working industry Sunbeam Stewart furnaces are designed to meet.

A. O. Smith is one of many satisfied users of Sunbeam Stewart galvanizing furnaces. Quality of work and low cost of maintenance and operation are key factors in Sunbeam Stewart's design that have proved their worthiness year after year. Users report dross loss as low as 5% and kettle life up to 6 years. If galvanizing is important in your manufacturing process, it will pay to consult Sunbeam Stewart. Designs are available for small or large production. We will be glad to submit ideas on how you can get more economical operation.

SUNBEAM STEWART INDUSTRIAL FURNACE DIVISION of SUNBEAM CORPORATION

(*Formerly* CHICAGO FLEXIBLE SHAFT CO.)

Main Office: Dept. 119, 4433 Ogden Ave., Chicago 23 — *New York Office:* 322 W. 48th St. *New York 19* — *Detroit Office:* 3049 E. Grand Blvd., *Detroit*
Canada Factory: 321 Weston Rd., So., Toronto 9

A letter, wire or 'phone call will promptly bring you information and details on SUNBEAM STEWART furnaces, either units for which plans are now ready or units especially designed to meet your needs. Or, if you prefer, a SUNBEAM STEWART engineer will be glad to call and discuss your heat treating problems with you.

Flame-Hardening Machine Offers Automatic Operation

Industrial flame hardening on a production level is now obtained in a universal flame-hardening machine.

Designers of the unit indicate that flame-hardened case does not stop abruptly in depth, but is bonded to the core metal by a transition zone. The physical qualities of transition zone grade from those of the hard case to those of the softer core. Case depth can be precisely controlled up to ½ in. without disturbing basic structure of core material. Flame hardening is said not to sacrifice essential qualities of ductility and toughness to achieve maximum hardness.

The Stearns-Roger Mfg. Co., Denver 2, Colo.

Pneumatic Comparator Inspects Automotive Roller-Bearing Races

Bore taper and all finished dimensions on automotive roller-bearing races are measured simultaneously by this automatic pneumatic comparator gage.

The instrument furnishes a direct reading of taper variations as small as 0.00005 in. It also sorts the pieces that are within all five tolerances. Gages have been used at speeds up to 1700 pieces per hour.

Thickness, OD, large ID, and small ID, are measured in one operation by separate air-gage components. Pneumatic gaging elements are interchangeable. Indicators for each dimension, and master signal lights, indicate condition of work.

Moore Product Company, Philadelphia 24, Pa.

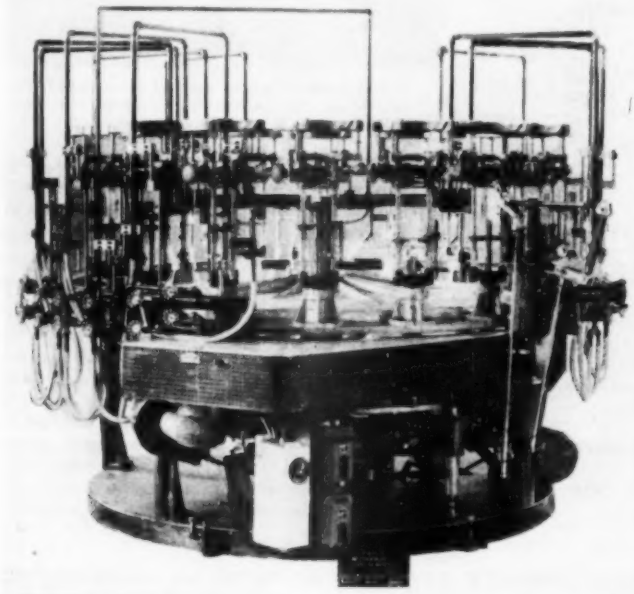
Eutectic Package for Repairing Zinc Die Castings

Use of a new package containing a quantity of Eutec-Die Cast-Weld with a jar of Eutector Flux solves the problem of repairing zinc die castings. Contents can be used for joining die castings to aluminum, steel, brass and bronze.

This low heat product can be used with or without Eutector Flux. Without the flux, buildups and overlays are possible.

The package contains 36 ft. of ⅛-in.-dia alloy and will average up to 200 welds.

Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N.Y.



ELECTRON-TUBE MACHINE seals cathode tubes. Shrinkage is held at a minimum. Machine has interchangeable adaptors which enable it to seal either 12 tubes (up to 16-in. size), or 16 tubes (up to 12½-in. size) per cycle of operation—*Kahle Engineering Co., 1309 Seventh St., North Bergen, N.J.*

Bassick Heavy-Duty Caster Has 5-, 6-, 8-in. dia Wheels

This line of forged-steel precision heavy-duty casters in 5-, 6- and 8-in. dia wheel sizes, utilizes strength of forged steel frame and top plate. Line is recommended for operating loads of 1500 to 2000 lb per caster.

The Bassick Co., Bridgeport, Conn.

All-Rubber Center Coupling Designed for Small Motors

Titled the Mighty Midget, an all-rubber center coupling has been designed to improve power transmission in fractional horsepower motors.

A neoprene center member gives coupling service life claimed to be ten times longer than ordinary couplings in its power range.

Flexing caused by misalignment is absorbed by the entire center rather than by sloppy fit of pins. It is said that the tight fit of the coupling pins, when pressed into the rubber center member, eliminates noise and vibration.

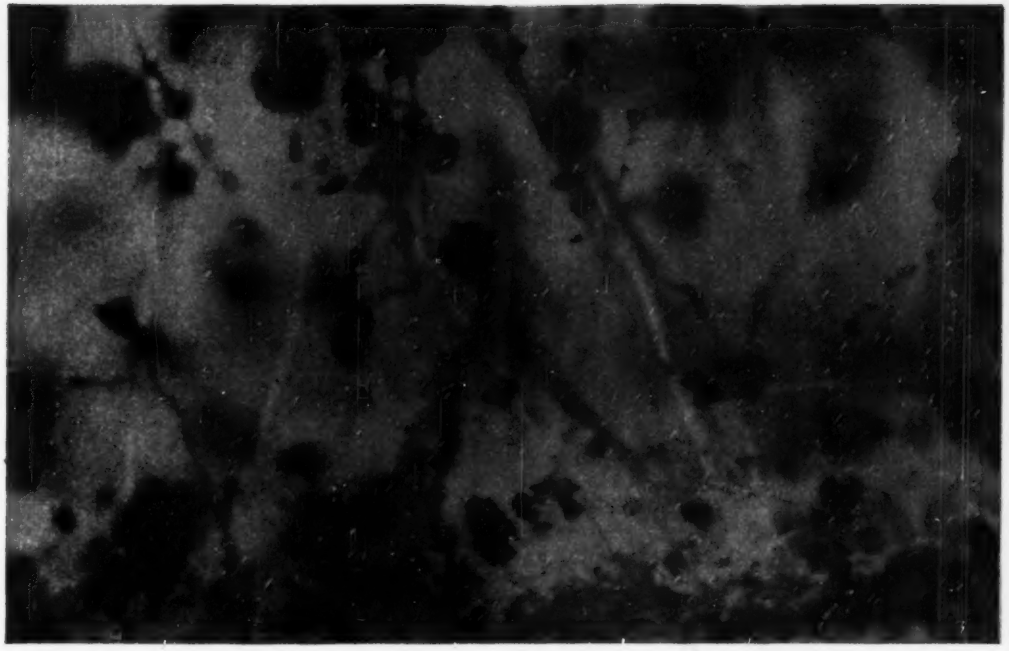
Morse Chain Co., 7601 Central Ave., Detroit 8, Mich.

Tuf-On Clear Coating Protects Fiber Articles

Tuf-On No. 82 clear coating for fiber protection fills the pores and inhibits absorption of fats, oils and greases. It acts as a sealer against perspiration and moisture. Based on Vinyl resins, No. 82 is tough and flexible and may be applied equally well as a protective coating for leather, cork, and paper products.

When a fungus- and moisture-resistant finish is required for treating electronic and electrical equipment, Tuf-On 76-S is recommended.

Brooklyn Varnish Mfg. Co. Inc., 50 Jay St., Brooklyn 1, N. Y.



An example of Aspergillus Niger or "Blue Mold"—a common mold magnified seventy times.

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RYERSON STEEL

ROUND TABLE Discussion

TALK OR SWEAT FIRST

If men could always be taken at their face value, the need for checks, either by the Als or the men in the front office, would not exist. While such a consummation may be wished, to expect it is to cry for the moon, and, if the check be really necessary, it is quite uncertain if either Al, or the front office, will realize this.

A man offered a job puts its securing above everything and his Sunday Schbol mottoes will be put on one side. To form an opinion of any person with whom one may have to associate is wise, whether that person be prospective machinist or wife. Even as the police force is rendered necessary by a very small percentage of the public, so is that percentage of prospective employees who make a check desirable. And it is an open question as to whether the wrong'uns will be discovered. The writer has known of more than one or two men who had passed the scrutiny of all the Als and yet were arrested in the works by the police for offences, one being burglary.

Under scrutiny of the amateur detective Als, the troublemaker does not confess, he dissembles and disguises his faults. A man who was a member of a trade union was trying to get a job in a non-union shop. Asked by the foreman if he were a member of a trade union, he replied, "Do I have to belong? Oh, I'll join at once if you'll give me a job." Needless to say, he was engaged and he had not told a lie. It is an old saying that one must live with a person to know him; get to know new men by all means; give them all the help possible, especially the youth fresh from home, but don't be cocksure that you have read him like a book because, if he be the one who really needs checking, he may have checked Al rather than have been checked by him.

P. E. James
Lincoln, England

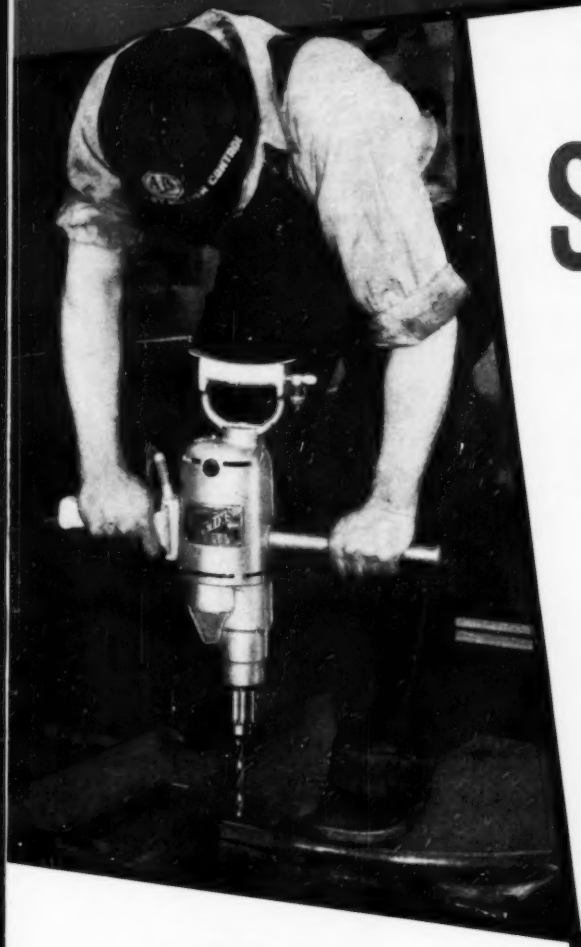
•

WORKING THE WILLING HORSE

Seeing that rush jobs are likely always to be with us, and that some of these will really be urgent, it may be helpful in getting the right perspective, if the use of the unwilling or incompetent man be considered.

Presumably, the prompt carrying out of a rush job will always be a

STAMINA...



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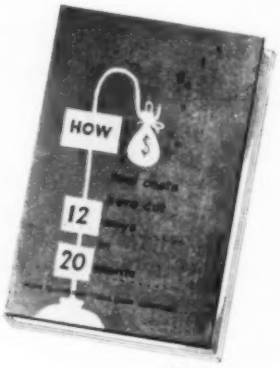

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major aim and its insurance a prime consideration. How is this most likely to be achieved. By using the lethargic or unwilling man or the one of quick comprehending thought and action, because the difference between the two is of this character. Not to use a man of this quality would be to advertise that the particular rush job in question was not considered to be really urgent.

I remember a rush job, altering of the angles of three bevel pinions. The job was given to two men, but one man had done two before the other had gotten going.

The wise policy would seem to be to use the willing or competent man and increase his pay, even if you cannot improve his status. Some firms make a practice of paying their more useful men specially higher rates of pay, partly among other reasons, to retain their services. The rewards in sport, and should in industry, go to the faster, more-useful men. To the firm, with whom such jobs are common, the "willing horse" is as desirable, if not as essential as the lathe or drilling machine. To "spread such jobs around" would seem to be in the interest of neither customer nor firm's reputation for doing a quick job. Let the quick, willing man collect his prizes and may this act as a spur to others.

J. E. Powell
Lincoln, England

•

IS BUSINESS, BUSINESS?

The question of reduction of work ing forces has been a stumbling block for years. Many foremen in times when business has slowed up have wished they were not part of the management that had to carry out the layoffs. The problem of picking good men is not hard, but now when unions have set up the rules to play by, it sometimes is difficult to end up with men that are actually best for the company.

Prior to the big unionized drive on seniority, management could and often did keep the best men. They also took care of their old employees as well. It is true that some companies were not fair, but on the whole the worker had as many rights as he has today and had to pay much less to get them. A foreman in those days could help to build up his men and he knew that if a layoff came, he could hold his best men.

Actually Al has no problem because under most union rules today, he must lay off his men by seniority. His case that Thomas was active in social and community welfare only serves to point out that Thomas

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is the better of the two men involved.

Business actually doesn't have the right to weigh what a man does on the outside when it comes to layoffs or advancement. Generally, however, the men who take interest in the life of the community and have some outside interests are the better employees. They are the employees who give the personnel department the least trouble and the employees who do the best work on the job.

It is unfortunate that such men have to be caught in this cold-blooded trap of unionization which makes men nothing more than puppets. They become men who have lost all their rights as individuals and are now nothing but members of a common herd led by union bosses—men who draw big pay and live far above the level of the worker. It is no great wonder that Socialism has taken such a hold. We have little freedom left between the rules of unions and the governmental controls. Yes, business is business today, but it has been forced into this corner. How can it do else? How can it help men when the union says lay them off first? How can business grow and survive future depressions if it cannot keep the best men on the job?

Too many people have been living in the clouds—dreams of good times. The days are fast approaching when business is not going to be able to survive. Then what? Governmental industry? It is about all that is left. Who is going to pay for that? There will be no pay—we will have sold our souls to the government. We will be as England is today—down and nearly out. Who will send us the money when we are on the ropes—assist us as we have poured the dollars into England's coffers? Surely It will be their chance to laugh and not Russia or Germany or England. say freedom and democracy never were a success—look at the United States—they are now Socialistic.

Too bad, Al, but unless you and your friend Thomas do more for your community than talk, we won't have many more chances to even think who is the best man.

It is sad but Al has to make his decision by seniority—for the way is rough and none too sure to fight seniority on the basis of a worker's ability to do a better job.

Let us all work to put a stop to this socialized trend. Let's give back to management its rights to run a sound business and not be saddled with drones.

Charles D. Townsend
Centralia, Mo.

One of the most difficult tasks that falls to the lot of the foreman is deciding who shall stay and who shall go when work grows scarce. It is more productive of gray hairs than any of the technical problems that afflict him, but like death and taxes, it cannot be avoided.

In the closed shop, where the union has established a seniority ruling, it becomes a simple matter of getting out the employment records and lopping off the johnny-come-latelies. In the process, the foreman may turn loose some of his more dependable men—but rulings are rulings. He can only hope that those boys are around when business picks up again.

The open-shop foreman is the fellow who really has need of the aspirin, particularly if he lives in a small town and the plant is its industrial mainstay. When his final decisions are made he can be sure of one thing—some members of the community are not going to be satisfied and will display their displeasure. Mr. Foreman and family are going to feel a distinct coolness in the air when they walk down Main Street—not attributable to the weather. A foreman's life is not a happy one when layoffs are in season!

But to get back to the business of making out the layoff list. Obviously, the most valuable employees should be kept, without regard to whether they are pillars of the church or paragons of civic virtue. In a strictly business sense, the foreman should only be concerned with what use the employee makes of the company's time. What a man does when the quitting bell rings and he leaves the plant is entirely his own affair. So the wise foreman doesn't follow Sam Smith when he heads for a nearby tavern to down a few beers after a hot day on the big planer. He knows that cast-iron dust particles have a tendency to dissolve when in contact with the amber fluid, and no matter how many Sam lowers, he will be standing by the planer when the signal is given to start work next morning.

The old saying that, "It takes all kinds to make a world," could be altered to read, "It takes all kinds to man a shop." The fellow who spends his spare time in worthwhile community activity is to be commended. No doubt he is a solid citizen in comparison to his fellow worker who spends most of his non-work time at the local bookie parlor, or at the poker table trying to fill inside straights. But, when the starting whistle blows in the morning and production is the main issue, in

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ASK US ABOUT NEW self-emulsifying solvent—Oakite Composition No. 97 to pre-clean metals for electrocleaning. Designed to clean aluminum and zinc die castings, steel, brass and other metals in your spray-washing machine. Emulsions speedily remove buffing, drawing and stamping compounds, mill and slushing oils, metal chips and shop dirt. Solutions last long. Don't foam. Firesafe. Arrange for demonstration.

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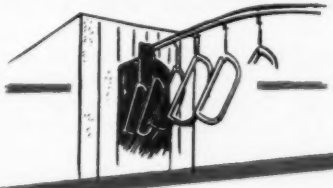

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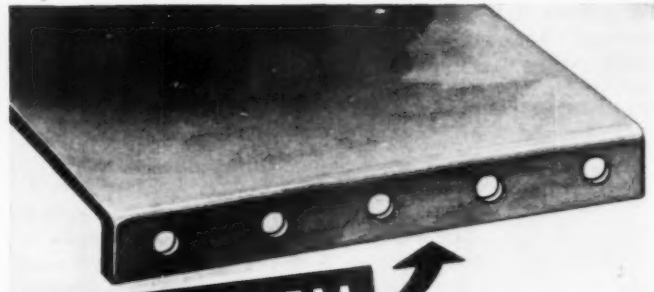
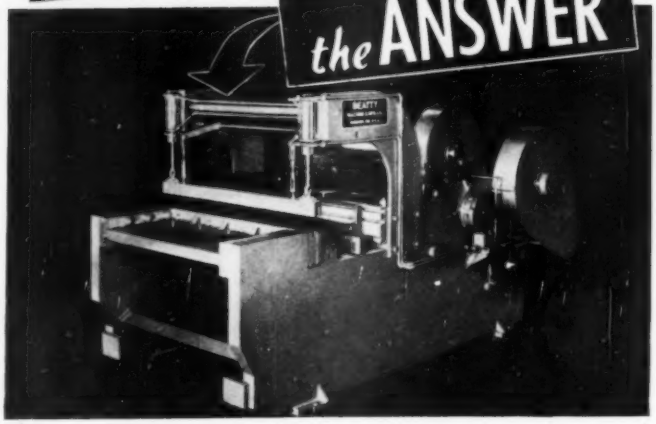


the PROBLEM

Punching a long line of holes horizontally through a vertical flange after forming.

the ANSWER



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Write for full details on the new Horizontal Multiple Punch.

HYDRAULIC SHEET METAL WORKING EQUIPMENT

BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

the foreman's book they should all start from scratch.

So, in the final analysis, business should be business. The foreman, being a direct representative of management, is entrusted with the responsibility of running his department as efficiently and profitably as possible in good times or bad. When times are bad, the responsibility becomes even greater to eliminate waste motion and cut operating costs wherever possible. In order to do this, he must retain only the men who have proved their worth in the shop—the men who can make the chips fly when the chips are down!

Robert S. Alexander
Greenville, R. I.

•

HARD SENSE OR HARD HEADS

I had some experiences in designing special machinery, and at times I was in the same fix as Ed. I asked every one I could get a hold of for advice on how to overcome my difficulties. I did not get it, but by listening to them my mind got out of the rut or groove it was in and I finished the machines.

Then again, I had a piece that I could not make to my own satisfaction by pounding over it in many ways mechanically. A shop sweeper asked me what I looked so worried about, and I not being afraid or ashamed of asking advice told him my problem. The sweeper who "did not know anything about mechanics" told me how he would do it and it was so simple there was nothing to it. It solved my problem and I was not ashamed to thank him and tell him that he was a great help to me, and that I would make it as he suggested, with some changes. Both of us were happy.

Yes, friend Ed, do as Al suggested. Get your men on the job. They might give you the idea for the job. They might even suggest a complete change of the plan for the die, so complete that you will think that it will not work because it will be a different approach to diemaking. Or by listening to them your own mind will be lifted out of the groove in which it was traveling, you will get a different view on the subject, and you will lick it as you did other jobs before.

Don't be afraid that your men, when suggesting to you some change, will get big-headed. If they are any kind of men when they do a job that they think is not right, they should tell you what they think.

I told many men, when given a job that I thought was not right,

Hot - but not bothered

RESIN BONDED

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Grinding heat can't affect the grain-grip of their resin bond. It retards loading, eliminates shedding, and keeps every grain cutting. Moreover, SPEED-WET METALITE Fibre Discs have a tough, all-fibre backing with the liveliness of spring steel. Get the extra "cutting mileage" of SPEED-WET METALITE Fibre Discs. They'll pay off every time.

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RESINALL METALITE® BELTS

They beat the heat in fast, continuous heavy-duty grinding. The heat-set resin bond can't melt, can't get "tacky," pick up chips, load or glaze. This belt cuts sharp and keeps on cutting sharp. There is 2 to 4 times more production with a RESINALL METALITE Cloth Belt. Try it out in your own shop — ask for a demonstration by a Behr-Manning Field Engineer.

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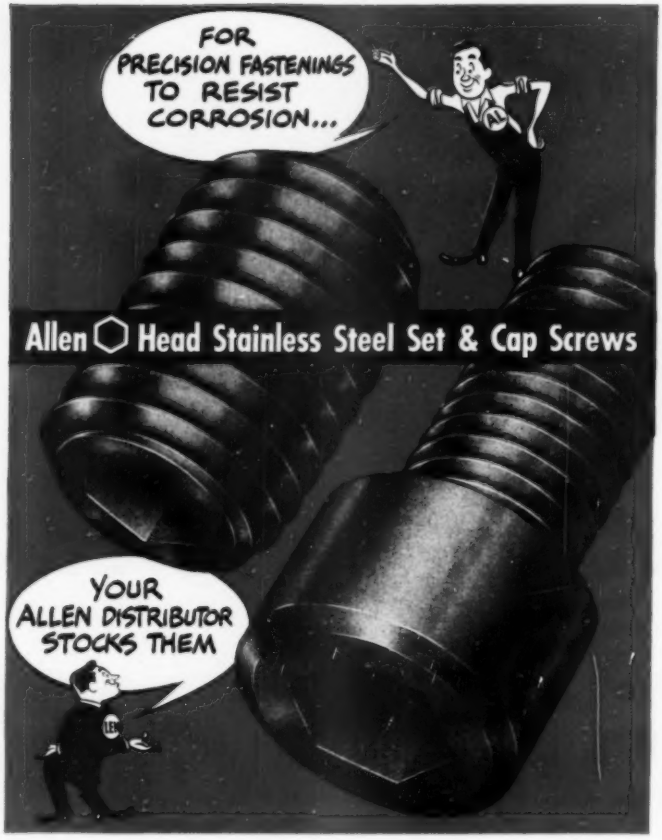
FOR PRECISION FASTENINGS TO RESIST CORROSION...
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YOUR ALLEN DISTRIBUTOR STOCKS THEM

When you need a combination of strength and resistance to most acids, alkalies or other corrosive substances, use stainless steel.

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WARNING
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NEW YORK CLEVELAND DETROIT CHICAGO LOS ANGELES

FOR 40 YEARS THE BUY-WORD FOR SOCKET SCREWS

that the job will be no good, that certain changes should be made. I always wanted to know what a job will do before I did it. The same applies to Al's men. Tell them what bothers you, they will try to be helpful, and they will think more of Ed for doing it.

After all, in any establishment, if the men only do as they are told, they will not do their best, not because it will be their fault but only because they are as automatons doing exactly what they are told, not as a part of an organization that works as a team knowing what it is all about, and if necesstary doing or correcting mistakes that might occur on a job.

If they know the job beforehand, what it will do, they can bring their past experiences to help. Pride in a job is to see that any job is done the best and quickest and most economical way. And as Al says, don't forget pride goes before a fall.

Michael Axler
New York, N. Y.

•

THE LOST THOUSANDTH

All of the talk and expense of world peace that is going on in the world today, and we can't even get the foreman and the engineering department to see eye to eye!

This is one shop that, if I were working in it I would see that I pulled up stakes and found a spot where the atmosphere was a little less suspicious. The main purpose of an engineer is to design the job and that of the foreman is to expedite the task. And here they are, like a couple of schoolboys, distrusting each other and running to someone higher up with tales of dishonesty and deceit. In my handling of this situation, unless it were an ever-recurring incident with the same individual, would be to see that the two come to a working agreement. I believe that the foreman in charge of the shop should be informed before any changes are made, be they small or drastic, because he is the one who shoulders the responsibility for the finished product.

There are many mistakes and misjudgments that fail to show in the drafting room and can only be found in the working of the job. Because of the training in a special field, the engineer is able to recognize these faults, and because of past experience and knowledge the craftsman is able to add his two-cents worth for a better product. But not before the powers are consulted. In my shop, any changes that are made are

*UNIFORMITY

Under all conditions, Tycol cutting oils more than meet the exacting requirements of the metal-working industry.

Rigidly controlled and tested during manufacture, Tycol cutting fluids retain their *UNIFORMITY — from the first drum to the last.

This unvarying high quality, plus the scope of the line, accounts for Tycol's wide acceptance among operators interested in finer finishes . . . freer, faster cutting . . . longer tool life.

Whatever your cutting need, let a Tide Water Associated engineer help you select the best fluid for your particular purpose. Call, write or wire your nearest Tide Water Associated office for full details.

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CUSTOM MADE For EVERY NEED

For best results, get in touch with Sewall engineers while your product is still on the drawing board. Close tolerances are efficiently maintained in the production of racks... sprockets... spur... spiral... bevel... Zerol bevel... worm gears. We furnish prompt estimates on any quantity.

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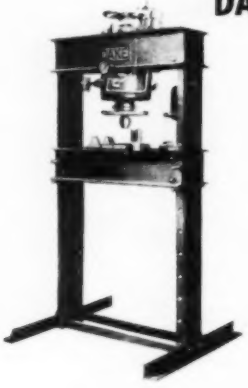
688 Glendale St. St. Paul 4, Minnesota.

DAKE AIR HYDRAULIC PRESSES

Speed Production
Lower Costs



The 50PB Air Hydraulic Press illustrated is a 50-ton capacity press of compact design with all operating controls within easy reach of operator. This accelerates the work and banishes operator fatigue. A speedy press to lower costs on assembly and disassembly; broaching, trimming, straightening, and bending; blanking, drawing, and forming; riveting and many other jobs in machine shop or on assembly lines.

The 50PB is one of several in this class ranging from 25-tons capacity to 125 tons.

No hand pumping . . . finger-tip control.

Pressure Gauge . . . at eye level.

Release Valve . . . returns ram to starting position.

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initialed by the suggestor and also noted by his superior. This system gives a check on the hurry jobs that sometimes skip the print department. Also to save any such condition as the one in question, when a pencil drawing comes out for production, it is presented to the foreman with a duplicate copy for checking purposes. This not only eliminates the possibility of "error changes" but in case of a lost or smeared drawing, there is a copy to fall back on. The organization that leaves itself wide open to error by just putting one drawing on the job, is sooner or later going to find itself in one of these trying predicaments.

If the foreman does not go to the rescue of his workers, and sides with the opposition, where is his self respect and that of his fellow workers? He was hired because of his skill and also his ability to control the morale of the shop. With a foolproof system, the engineering department will be satisfied and the foreman will know that the integrity of his men is not at fault. Just a few more minutes on a drawing board is worth many hours of hurt and angered feelings.

Jack Bell
Bakersfield, California

•

Discussions regarding the lost thousandth are certainly interesting, and varied. In this case it might almost be called "the lost job." I had a case many years ago which, while not like this, is recalled by the discussions.

I was working in the drawing room of the old Wheelock Steam Engine shop, Worcester, Mass., and found that the rods for the valve gear were never cut to length until the engine was set up on the erecting floor. Then the measurements were taken and the rods cut to length. This did not appeal to Charlie Jenness or to me, so we laid out the rod lengths for the next engine and had the rods cut before the engine was assembled. Then came a howl from the erecting-floor foreman. The rods were too short. He knew you couldn't figure the length of the rods before the engine was made. So Charlie and I went down on the erecting floor one noon with a steel tape to see what was wrong, taking engine-bed blueprints down with us. The rods were short all right, but the engine bed was long by the amount the rods were short. In machining the ends of the bed, they had merely cleaned up the castings without reference to the length on the drawings. Of course, it was

• Power Indexing • Automatic Power Positioning
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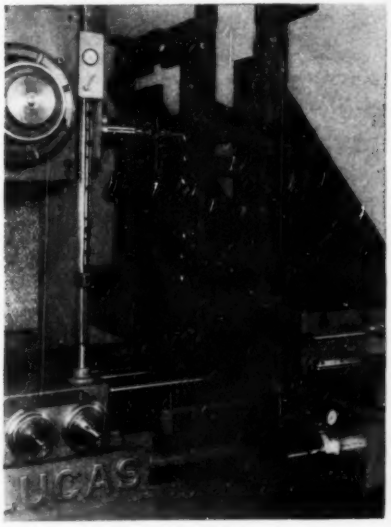
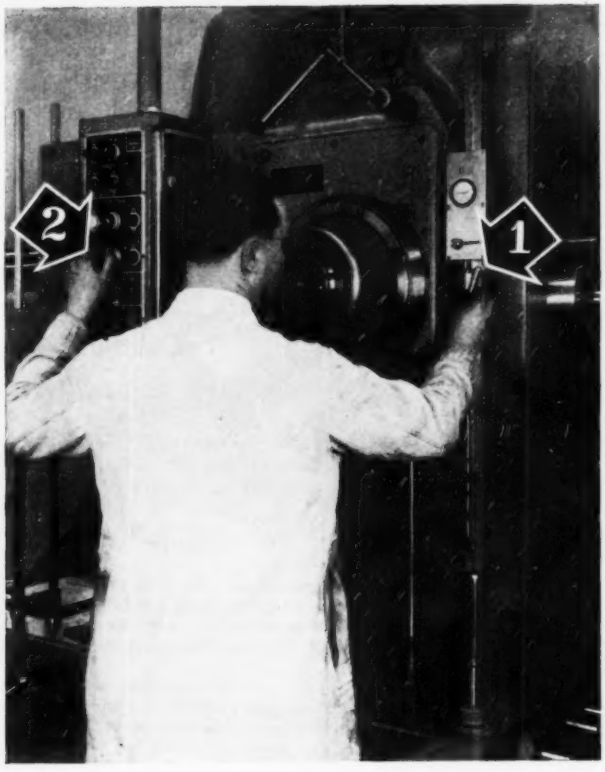
Whatever YOU call it LUCAS HAS IT

Since we introduced the addition of power positioning to the use of end measuring rods twelve years ago, this Lucas feature has gone by different names in the plants of different customers — but all agree that it has revolutionized the usefulness of the horizontal boring machine, making it not only a versatile machine shop tool, but a highly accurate production machine.

Here's how it works: First hole has been bored. At 1, (right) operator removes top rod of same length as distance to next operation. At 2, he

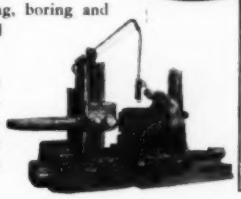




pushes the head down feed and rapid traverse buttons on movable pendant. Spindle head feeds down and is automatically positioned when dial indicator contacts end of next rod. Automatic positioning of the table is controlled by other end measuring rods and dial indicator which operate exactly the same way.

By using a machined surface as a basic reference point the operator can automatically position the center line of the spindle to the center line of any operation with extreme accuracy, *without the use of jigs or fixtures.* On production work it will positively repeat a series of drilling, boring and milling operations on any required number of pieces.

Wherever they are in service, Lucas Precision boring, drilling and milling machines accomplish basic savings in both tools and time. Their versatility is so great that they are kept in practically constant use.



Built in 3", 4", 5" and 6" spindle models, all available with automatic power positioning. Work ranges from 36" x 36" to 96" x 120". All sizes furnished with either two-way or four-way beds, and feature high and low speed ranges to a single spindle. Write for descriptive literature.

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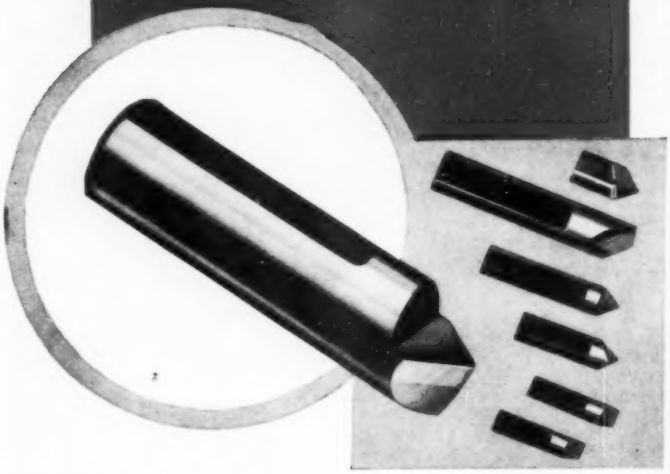
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO

Here's Your Opportunity to Make **BIG SAVINGS** in replacements of perishable, precision tools



CONTINUAL replacement year after year of carbide boring tools for such machines as the Heald and Ex-Cell-O precision boring mills runs into a lot of money. It's not the speed at which these tools wear out, it's the cost of replacing them that bothers production men.

The life expectancy of our specially made carbide boring, facing and chamfering tools is as great as that of any high quality precision tools. But like other tools they must be replaced because they are perishable. Our service, therefore, has been developed to reduce the cost of replacement by cutting costs of tool production. We have achieved this objective by making a specialty of producing a specific class of carbide tool *to customers' specifications.* We can furnish these tools promptly at prices which represent outstanding savings. It will pay you to investigate NOW. Send for illustrated literature. Let us have your blueprints so we can quote on your requirements. You'll be interested in our low prices.

●

Our specialized service applies to a wide range of diameters, any length. Prices are based on stock diameter and not on individual tool shapes.

INDUSTRIAL CARBIDE TOOL CO., Inc.

33 Harmon Street **WORCESTER 8, MASS.**

cheaper to make new rods for that engine than to face off the ends of the bed. But we watched the next engine and the rods fitted o.k. No one had changed the drawings; they just ignored them.

I am also reminded of the tales they told of an old master mechanic on one of the New England railroads who never made drawings for his blacksmith. Instead he drew the shape of piece he wanted on the dirt floor of the blacksmith shop, to give him the idea, then he wiped the drawing out with his foot. The old blacksmith was good and generally made about what was wanted. If he missed it, he had no alibi that he had followed the drawings.

Fred H. Colvin
Point Pleasant, N.J.

●

CAN ENGINEERS COME INTO THE SHOP?

Engineers coming into the shop is an idea as old as the hills, but you obtain the maximum of cooperation if supervision is informed.

Prior to the first World War in a large plant in Britain, jigs and fixtures were made that cost from a few dollars to upward of $50,000. They had to be correct.

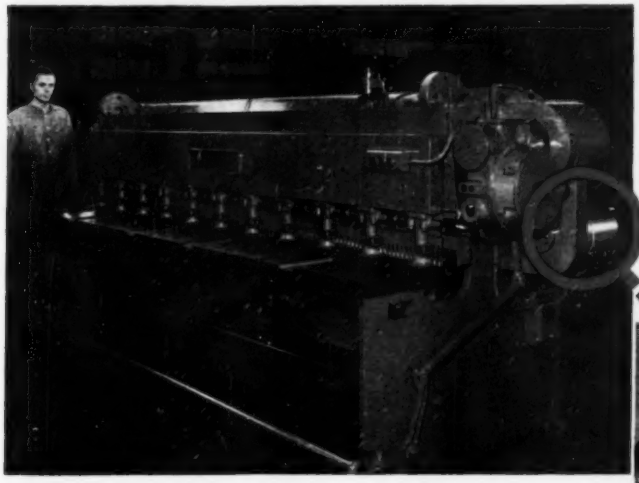
Would it not be the height of foolishness and supervision to start and finish such jigs and fixtures without the engineering department being on hand most of the time to check and change, if found necessary, as Thomas is apparently doing in Ed's department?

The procedure in that plant was that the chief engineer would come into the toolroom office and inform the superintendent that he would like one or two of his draftsmen in turn to check up and advise on procedure as the work proceeded. Draftsmen would come down and make the acquaintance of the superintendent, then on the job they would be introduced to the four or five toolmakers who were working on the fixtures. They were informed that whatever change Thomas suggested they, the toolmakers, would carry them out.

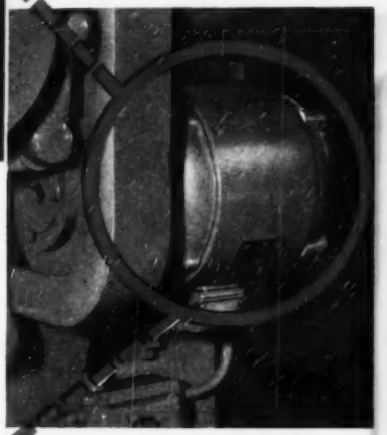
Ed, as toolroom boss, would keep himself informed by keeping in touch and cooperating with Thomas. Under such an arrangement the question of authority doesn't enter.

Authority is not important, anyway. Just because some tiny little bit of what we call authority has been lent to the engineer for a little while, that doesn't excuse Ed, or let him out of his responsibility as foreman to lose interest in the work Thomas and his men are working

A.O. Smith Builds ELECTRIC MOTORS



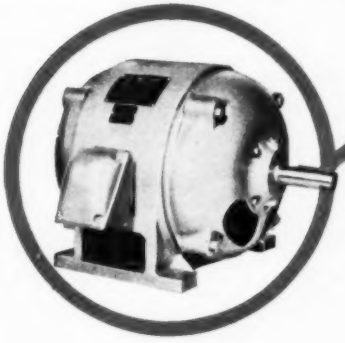
for hundreds of products, including CINCINNATI SHEARS



Ask the A.O. Smith man about electric motors for both special and standard uses

To help you integrate motor design with product design—to achieve the most efficient and most economical operation—the research and engineering staff at A.O. Smith is at your disposal. If you seek improved performance in your product, if you require special characteristics in your power component, in custom-built or in standard electric motors, consult the A.O. Smith man. Typical of his service is the machine tool, illustrated here, of The Cincinnati Shaper Co.

WRITE FOR A.O. SMITH BULLETIN No. EM-152



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A. O. SMITH ELECTRIC MOTOR for the Cincinnati Shear is 5 hp, 1800 rpm, a punch-press type with high starting torque, 8 to 13% slip—an open motor, frame 225, with prelubricated double shielded ball bearings.

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To more than 200 authorized service stations, A.O. Smith Product Service Division provides fast, low-cost electric-motor service, on a 24-hour, off-the-shelf basis. Factory Service Branches and Warehouses at Union, N.J., Chicago, Dallas, Los Angeles.

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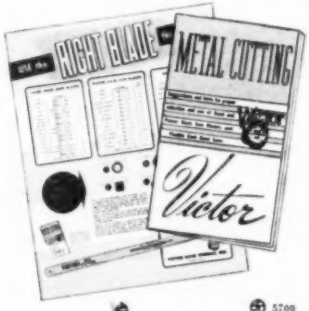
While you're at it, ask him for a free copy of the Victor Metal Cutting Booklet for your pocket or tool kit and the Victor Wall Chart for your shop. Both are packed with helpful hints on selection, care and use of hand and power hack saws.



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on. His job is to keep in contact and co-operate. That's teamwork, and that goes whether Ed was informed or not, because in the final analysis if the final product was faulty Ed could not entirely escape blame or responsibility.

In conclusion, the engineer who is responsible for design and proper functioning of tool and fixture is in exactly the same position as the architect of a building who visits the project. The finished product must have the workmanship and materials called for in the plans, and how could he O.K. the finished product unless he had been regularly inspecting as work proceeded?

Arthur Silvester
Niantic, Conn.

•

Yes! but, with reservations not covered in the article.

To design a tool, product or any device used or produced in manufacture, put it into the shop with a "freeze" order on it—permitting no change, deviation or substitute is, it seems, a hampering restriction that has no place in modern industry. There are many things we create for use solely within the plant, with product betterment or increase in mind, of which the ultimate intention of use is the only clear picture. The type of material to be used, length of this, breadth here, connection there, may or may not be identified clearly in the mind from experience—where the idea is new, what then? It is to be hoped no one is going to speak up and say "When you put it on paper, everything must be there—that's it and the way it must be made, we have neither time nor money to waste on shop modifications—and if you're on the job there'll be no need."

Conceded that from an economic and copybook standpoint this is the acme, just how long would it reap the maximum benefit for the company? There are a number of jobs, a great number, for which we create the designs for a product, or the tools, or the fixtures, in which the drawings may go to the shop and the work be processed through exactly as indicated on the prints. However, occasionally, especially on a "make one" order for use in the plant and even for an outside customer, if the costs will allow (and surely the estimator will have made margin for contingencies) a better idea will occur to someone involved. How much more efficient then to reap the benefits that may accrue from such flexibility and how much more enthusiasm you find brought to the task if a workman is permitted, now and

CROSS UNIVERSAL GEAR MACHINES
for
• ROUNDING
• CHAMFERING
• POINTING
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Cross Universal Gear Machines embody advanced engineering developments to obtain highest productivity and assure lowest possible operating costs.

They feature utmost flexibility for handling a wide variety of gears. Continuous cutting motion, exclusive with Cross, speeds production at top efficiency.

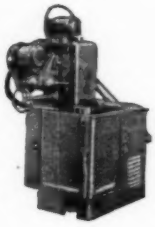
Special skill is not required because machines are automatic and push button controlled. Power clamping is foot pedal controlled. Both hands are free for work handling.

No. 55

For rounding, pointing, chamfering or burring external and internal:

spur gears
helical gears
clutches
splines

Typical productivity when rounding or pointing 8 pitch 30 tooth gears is 55 net hourly.



No. 65

For pointing or chamfering external and internal:

clutches
spur gears
bevel gears
splines

Typical productivity when pointing 10 pitch 30 tooth gears is 100 net hourly.

No. 75

For burring or chamfering both ends at the same time.

helical gears
spiral bevel pinions
hypoid pinions

Typical productivity when chamfering 8 pitch 40 tooth gears is 200 net hourly.

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Established 1898
SPECIAL MACHINE TOOLS
MILLING • DRILLING • TAPPING • BORING
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DETROIT 7, MICHIGAN

NOW a 50-ampere Contactor FOR SMALL SPOT WELDERS

CLASS 8990 TYPE DG-1
SIZE OW WELDER CONTACTOR

SAVE 3 WAYS

WITH NEW SQUARE D HIGH SPEED CONTACTOR

- LOW COST
- SMALLER SIZE
- MINIMUM MAINTENANCE

Specify new CLASS 8990 TYPE D MAGNETIC WELDER CONTACTORS to handle transformer primaries of spot welders rated approximately 10 KVA, 220 volts; 20 KVA, 440 volts and less. For fully automatic control at minimum expense use them with Square D's popular Safront timers.

Simple vertical action, short stroke, hardened parts, and complete accessibility contribute to long life with low maintenance cost. Contacts and coils are interchangeable with Square D Size II motor starters.

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● There is no one type. Square D builds both magnetic and electronic controls of many types—each best suited to certain types of applications. Specify Square D, and be sure of getting the best for your job.

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MOTOR DRIVEN TIMERS
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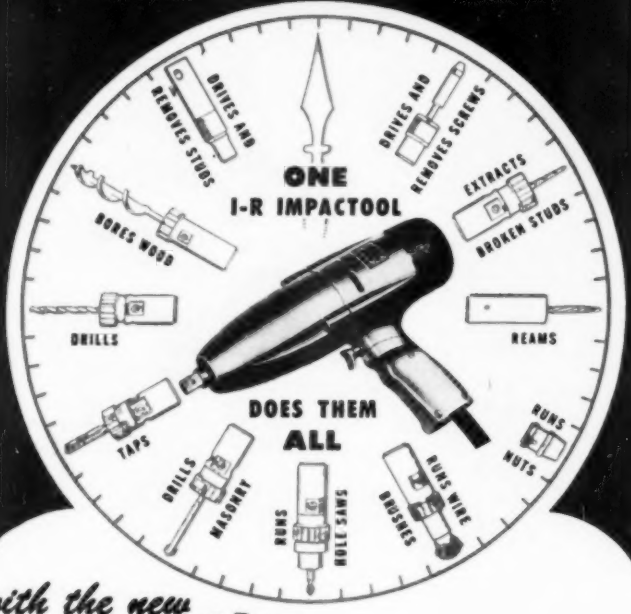
NOW IS THE TIME...
to cut job costs



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SIZE 8U ROTARY ELECTRIC IMPACTOOL

Rated capacity ⅝" bolt size

Not eleven tools to do eleven jobs—but eleven tools in *one*—a real multi-purpose tool—an engineering marvel made possible by the amazing power produced by thousands of rotary impacts.

There is no kick or twist even on the toughest jobs—motor burnouts are eliminated because the motor continues to run smoothly even if you stall the spindle completely—and you will save time and money on all operations—nut running as much as 90%.

An I-R Impactool pays for itself in 30 days with normal use.

Ask your Ingersoll-Rand distributor for a demonstration,

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11 Broadway, New York 4, N. Y.
ORIGINATOR OF IMPACTOOLS—air and electric

KIT No. 1—IMPACTOOL, with standard equipment, plus a complete assortment of attachments in a Handy De Luxe Case
110 V or 220 V, AC or DC models available

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then, not only to make a suggestion but also to see it incorporated in the finished goods.

Perhaps a personal confession that might be construed definitely as laziness would serve the best. In designing equipment for materials-handling, office air-conditioning, or simply a rack for a production control board, it has been found that beyond limiting dimensions, or special features, required for the job, a certain amount of haziness or omission of details is desirable. Once the workmen have become familiar with such treatment the response is for the greater part favorable. After all, if either a coping or a mitre will serve and the welder prefers working with one more than another, it's no skin off anyone's nose to have it thus. Such treatment opens up avenues of goodwill and constructive thought. It is so easy for the welder to say to the engineer, when the latter "comes into the shop"—"Figured coping would be OK here—since it's not detailed . . ." and upon receiving assurance (enthusiastic assurance) that that was OK,—the welder like as not may add, "Say I was wondering, you want to do so and so with this—right? Right, well supposing I was to add a transafrans to the scheedamof here and cut this leg off—say about 4 in. from the end? . . ."

You just don't know what a help like that can be at times to you, to both of you. It may give an entirely new slant to the basic idea and improve it 100% or may be of no actual physical good at all but serve only to strengthen the engineer's faith in why his own design is definitely the best for the job, a feeling brought to the fore as he explains why the original had better stand and the suggestion couldn't. If the suggested idea is good, "be lavish with praise and approbation"—you've made a friend and a brother if you're a designing or industrial engineer. Friends in the shop are mighty good things to have if you want to get those "Rube Goldbergs" across.

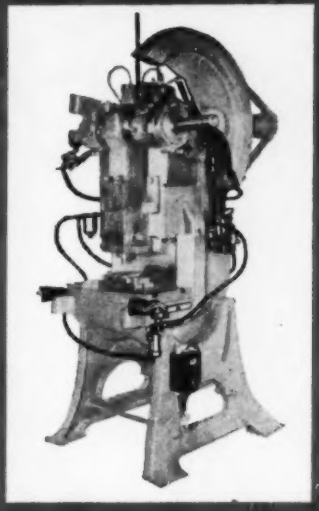
Having that sort of thing in mind the "Engineer Can Come Into The Shop"—and do a lot of good, but if his intentions, unconscious or deliberate, and manner, like Ed's "draftsman" is to succeed at "Operation Fubar" he better stay away lest we all get thrown out, in a body.

A. M. Elliott
LeRoy, N.Y.

•

To permit the draftsman to enter the machine shop and change instructions issued by a foreman, or to change details of drawings to suit himself, can only lead to confusion,

Years of *ECONOMY SAFETY EFFICIENCY* for Minutes of Thought



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the loss of respect of the men for their foreman, and result in petty jealousies on the part of the foreman toward the draftsman. If on the other hand the draftsman enters with the spirit of co-operation, with the intention of improving the product and keeping the foreman informed of all changes, an improvement in the product will definitely result.

Many foremen are jealous of their position and resent any one giving orders to their men, or having their orders changed without first being consulted. This is a natural reaction since we all like to be right and often feel that any change of our plans is a reflection on our ability and judgment. The foreman also likes to be in a position to be able to give his superiors, or others concerned any information regarding progress, promise dates on jobs and be conversant with all details of the work going through his department. If he is unable to do this, he would often find himself in a very embarrassing position, a condition which would result if others were allowed to reverse or alter his instructions in any way.

In all fairness to the draftsman, we should consider that a design is a product of one or a group of persons' imagination put on paper, for the purpose of further discussion, changes and developments, and in many cases weaknesses and faults which are not apparent on paper become obvious during the construction stage. Permitting the draftsman to aid in the construction of the product, and allowing changes to be made before they become too costly, appears to be a very sensible thing to do. It is further reasonable to assume that in this way he can avoid similar errors in future designs.

Yes by all means permit the draftsman to follow up his designs thru the shop. The foreman will find that he can often save himself many hours of valuable time if he will consult with the draftsman to find out just what the ultimate goal of the design is. This should result in a more efficient job at a reasonable cost, a condition which will reflect on both, helping them to do a better job.

Robert T. Knotek
University Hts., Ohio

•

Having gone through the same problem myself I can appreciate how Ed feels when the engineer or draftsman changes the design or the procedure during the course of operation. It is the foreman who is responsible for production, quality and morale of the department. It is the foreman's duty to see the work-

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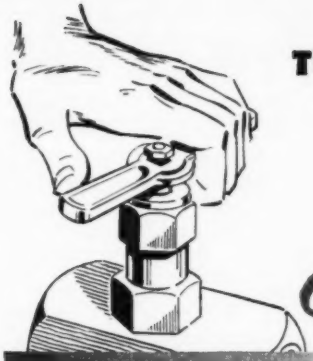
man knows all there is to know about the job assigned to him and he should also know how the job is progressing. No job should be altered either in design or procedure by any employee unless the foreman is first notified. This policy should hold true from the president all down the line. Any major change in tooling should have the superintendent's approval.

To have a draftsman make an alteration or a variation other than that called for in blueprint or specification without due notice to the foreman is also very confusing to the workman. Certainly it is not good for the morale of the department when a member of some other department gives the orders over the foreman's head. Regardless of the character of the change in construction or design, policy or practice—it should be well planned by all concerned.

In a major change we should have the point of view of the superintendent, engineer, foreman, draftsman and workers. In doing it in this way everybody will be happy to make the change and the new change will seem easy to make. There is no better way to make a change you want to make than to let everyone have a part of it. On the other hand there is no one thing that so gets a foreman's goat and makes him rankle with discord and ill feeling than to have someone come into the department and make some alteration—without due notice. If there is any one secret to success in making a change or in getting the job better done it is to get the other fellow's point of view as well as your own angle.

In the final analysis we must have

"We can't say much . . . he made it on his own time and it puts out more work than he did!"



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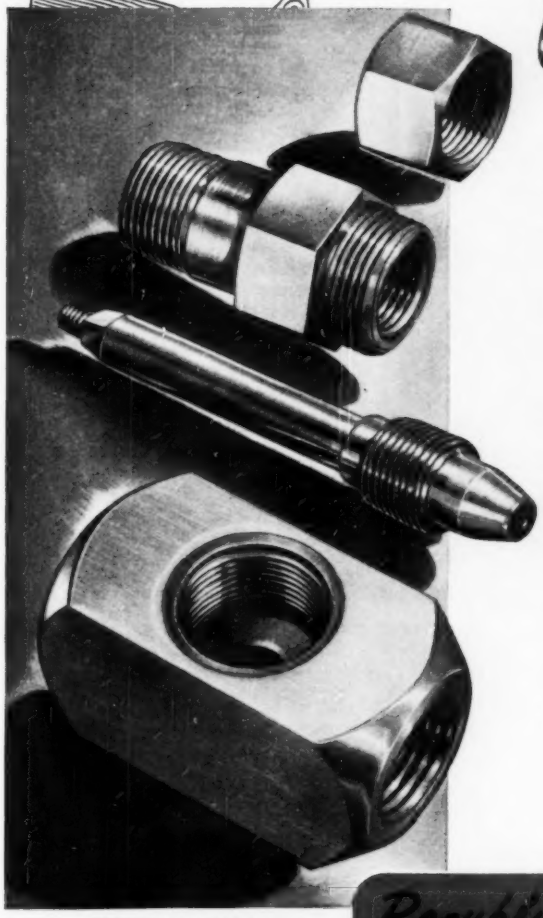

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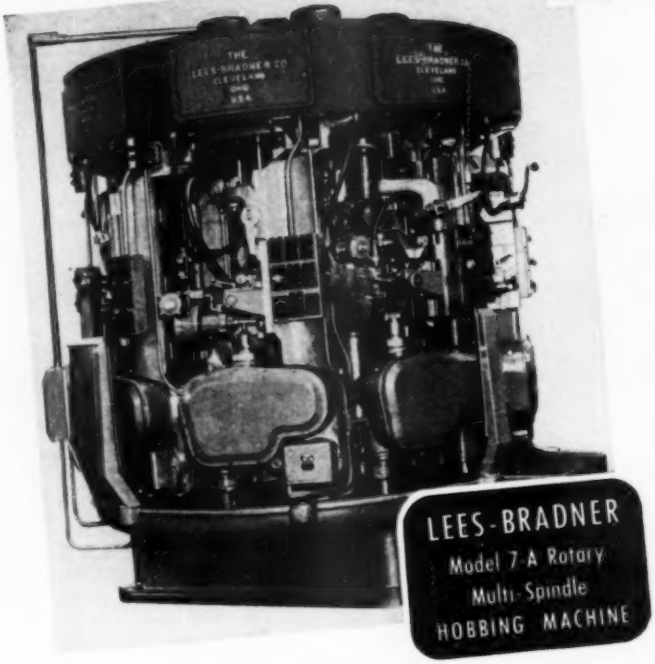

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Write for Bulletin A-59

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the desire to be thoughtful of the other fellow's feelings, his ideas. We must have consideration for everyone who is affected even indirectly in any alteration or variation.

A. E. Salmons
Philadelphia, Pa.

•

TEN CENTS A CHANCE

While I am in favor of allowing workmen to have their way in the shop as far as consistent, their plans should have some redeeming features.

It is evident that quite a portion of our people enjoy and do take part gambling is also evident.
in raffles. That a raffle is a form of

That it is not a fair and honest business there is no doubt, due to the fact that tickets are sold in numbers in nearly all cases to an extent that the article being disposed of brings a price far beyond its value.

Some tickets are purchased with a charitable view and some just because the purchaser does not want to refuse to purchase from one of his shopmates.

Certainly a raffle does not build a good clear atmosphere in the shop. The man who is in need of disposing of his kit of tools or any part of them, by making it known among his shopmates can usually dispose of them and keep his self respect as well. While he may not realize as much for them he need have no regrets as his dealings have been square with his fellow workmen.

Abel Blakeman
Westervliet, N. Y.

•

Someone should take poor Al in a corner and tell him the facts of life. Not pertaining to the birds and bees, of course, but those relating to the peculiar propensity of the genus homo for patronizing schemes where by the lowly dime will be transmuted by the alchemy of chance into "folding money." Or can it be that he knows about the all American dream of getting-rich-quick and would banish it from the confines of his little realm? If so, he must be descended in direct line from King Canute of old—remember the old boy who had his courtiers and other stooges place his throne on the seashore so he could command the incoming tide to go back?

Like Canute, Al is all wet in assuming he can eliminate the selling of "chances" in the shop, because better men than he have tried it and failed miserably. I have seen chances sold in the shop on such widely separated articles as com-

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forters from the Ladies Aid, bottles of genuine Mountain Dew, the Irish Sweepstake, and a 30-ft. fishing boat. In each and every case the foreman knew what was going on and usually had several chances on each item—*sub rosa*, of course!

I can imagine a fellow like Al would question the ability of such a foreman and raise doubts about the efficiency of a shop wherein such goings-on were tolerated. But I can assure him each man in the shop met his production quota whether he sold chances or bought them, and woe betide the individual who tried to sell tickets that weren't on the level—his stay was very short indeed! Yes, Al, these men were seasoned, capable foremen, who realized that a certain amount of latitude is appreciated in the shop, and that a man can plug along at the bench or lathe, day after day, only if he has something to look forward to; even the purchase of a ten-cent chance helps to break up the monotony, and the prospect of winning can color the drabbest day.

Let the "wise" boys, like Al, break out the slide rule and waste their time figuring the chances against the average man winning an automobile at one of those carnivals that break out like a rash throughout the country during the spring, summer, and fall. The odds are astronomical, but the printing presses roll, and they keep on selling tickets.

So, Al, take a tip from Ed. Let the boys in the shop have what our English cousins call their "little flutter," as long as they don't abuse the privilege. If you get stuffy about it, five will get you ten they do it anyway—via the underground. Remember what happened to the Eighteenth Amendment?

Robert S. Alexander
Greenville, R. I.

NEW BOOKS

MACHINE TOOL SELLING. *By Prof. Harry J. Loberg, head, Dept. of Indus. & Engrg. Administration, Sibley School of M. E., Cornell University. 194 pages, 6x9 in. Published by the McGraw-Hill Book Company, Inc., 330 West 42nd St., New York 18, N. Y. Price $3.50*

You may recall the sales refresher course at Cornell in 1948 (see *A.M.* 12-page news report, Aug. 12, 1948), and the further ones this year at Dartmouth, Cornell, Western Re-

Preventing END BEARING OF GEAR TEETH...

- increases their factor of safety
- reduces gear noise
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Conventional gear teeth (spur or helical) can be expected to behave as they should theoretically only on the drafting board. When they are made of steel and assembled in a power unit, it is a rare accident when bearing is uniform across the entire faces of any two mating teeth. In nearly every case bearing is concentrated at one end of the tooth or the other where it is most vulnerable to failure.

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One nationally known manufacturer of trucks and tractors received frequent complaints of gear tooth failures until he adopted the Elliptoid Tooth Form. Since then such complaints have practically vanished. Elliptoid transmission gears tested by this manufacturer for 125 hours under a load of 140 foot pounds and then for an additional 125 hours at 180 foot pounds showed no harmful effects.

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serve, and Purdue. This book is in effect a summary of last year's course and the basic text for this year's courses. It covers all phases of machine-tool selling from motives for buying to follow-through after the sale. Chapters cover such subjects as market analysis, equipment selection, economics of installation, selling to the government, and the relationship between builder and dealer.

Any machine-tool salesman, neophyte or veteran, can use this practical manual to improve his selling technique and increase his sales. Methods described have been proved in use over the years, and will help any seller to render a real service to the buyer—the basis of all long-term successful selling.

•

INDUCTION HEATING. *By N. R. Stansel, formerly engineering consultant, Industrial Engrg. Div., General Electric Co. 212 pages, 6x9 in. Published by the McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. Price $3.50.*

Electrical and thermal principles of the use of eddy currents for heating, and their application in practice, is the objective of this book. Principles are presented in formulas and charts and supported by measurements. Examples cover both metal melting and heating. A number of tables are provided for calculations.

This book is primarily on fundamentals and is particularly suitable for the electrical engineer dealing with this heating method.

•

TABLES FOR ENGINEERS—*By Dipl. Ing. Theodor Ricken. Published by Carl Hanser Verlag, Munich, Germany, 1949. Illustrated, 292 pages. Price, 11 German marks for half-linen covers. Printed in German.*

Data from various branches of engineering are collected here, with frequent reference to German national (DIN) standards. All data are in metric units. The thirteen sections cover: arithmetic and mathematics; technical and physical units; strength of materials; materials, ferrous and non-ferrous; steel sections, sheet metal, wire, pipe and tubing; machine elements; workshop processes (metal removing, welding, heat-treatment); engineering drawings; fits between cylindrical parts; transportation equipment; heat engineering; electrical engineering; and building construction.

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New Valve Catalog 251

Gives full information on the Hanna Valve line.

You can be assured of long, trouble-free service with valves designed and made by Hanna—for Hanna Valves have a reputation throughout industry for excellent performance over the years.

In the equipment you design and build . . . in the equipment you use . . . specify Hanna Valves and be sure of the best. There is a Hanna Valve for every control problem.

Hanna Engineering Works

HYDRAULIC AND PNEUMATIC EQUIPMENT . . . CYLINDERS . . . VALVES . . . RIVETERS

1765 Elston Avenue, Chicago 22, Illinois

Magna-Lock

MAGNETIC HOLDING IS *Revolutionizing* SET-UP TIME

- GRINDING
- MILLING
- SHAPING
- DRILLING
- TURNING
- PLANING

On these jobs and many others, we'll hold your work with a MAGNA-LOCK Magnetic Chuck and cut your set-up time as much as 80%. Write us today. Tell us your chucking problems. We'll help you solve them.

Request complete catalogue 049-1

Hanchett
MAGNA-LOCK CORPORATION
Box A-189
BIG RAPIDS **MICHIGAN**

Watch for:

A new magnetic chuck accessory for the holding of non-magnetic materials. Our announcement appears in the current issue of New Equipment Digest.

Paul L. Gillan

Paul L. Gillan has been named chief engineer of The White Motor Co., Cleveland. He joined White in 1943, serving as engine design engineer and experimental engineer prior to his new appointment. His previous experience was with American LaFrance Fire Engine Co., H. H. Franklin Motor Car Co., Lycoming Motors, and Lawrence Engineering & Research Co., Linden, N.J.

Charles E. Palmer has been elected a vice president and a director of Package Machinery Co., East Longmeadow, Mass. He was formerly president of the Frank D. Palmer, Inc., Chicago, which has been purchased by Package Machinery, and will operate as the Palmer Division.

F. S. Hajek has been named manufacturing engineer of the General Electric Co.'s electric vacuum cleaner division, Bridgeport, Conn. **Neil J. Curlee** has been named assistant manager of manufacturing engineering for the Appliance & Merchandise Dept.

Glenn H. Alberga

Glenn H. Alberga has been appointed plant manager of the Laminated Shim Co., Glenbrook, Conn. He was formerly with John J. Plocar Co., consulting management engineering firm of Stamford, Conn., where he has been general manager and chief engineer for the past seven years.

"There Must be Something Wrong Here, Boys"

And There Is . . . . . if someone hasn't found the way to CUT HANDLING COSTS IN HALF !

Did it ever occur to you, with prices under pressure, sales declining, profits being squeezed, that your order to "*Lay low on capital expenditures*" actually has helped sky-rocket your costs?

Do you know that many large concerns have hit on almost a magic formula that gives quick relief from the headaches of rising costs? They found a way to CUT HANDLING COSTS IN HALF. *That way,* is the Automatic Electric Truck way.

These amazing electric trucks lift, move and stack your material ceiling-high with easy, finger-tip operation . . . hundreds of pounds, or tons. One operator handles more material than three workers could by antiquated manual handling methods, releasing two men for more productive work.

So, when your cost figures call for a showdown, instead of saying: "*There must be something wrong here, boys*", consider *how much* Automatic's *50% saving in handling costs* could change your top-heavy costs picture.

And has it ever occurred to you, that your competitor can *undersell* you because he enjoys a large saving using Automatic Electric Trucks? Saleswise, for *every* $5,000.00 saved in cutting handling costs, you earn the equivalent of a 5% profit on $100,000.00 *worth of sales!*

Mail the coupon for all the facts . . . and then you'll see why Automatic equipment is *not* a capital expenditure, but a money-making, cost-cutting *bonus, every time* you handle material!

Automatic ELECTRIC TRUCKS — Lightens LIFE'S LOADS

Transporter — A PRODUCT OF AUTOMATIC — Lightens LIFE'S LOADS

Trade Automatic Mark

59 W. 87th St., Dept. P-9, Chicago 20, Illinois

Please send me complete money-saving facts on amazing Automatic Electric Trucks without obligation.

Company name.....

By.....*Position*.....

Street Address.....

City.....*Zone*.....*State*.....

WORLD'S STANDARD
of
Angle Measurement
H. D. BLOCKS and FIXTURES
STANDARD STEEL BLOCKS
CARBLOX CARBIDE
ANGLE BLOCKS
Degrees, minutes and seconds in any combination are at your fingertips with a positiveness and speed that has never before been equalled.
The accuracy of the laboratory has actually been brought into the shop. Information on this newest Webber contribution to precision is yours on request.
Webber
GAGE COMPANY
12901 TRISKETT RD.,
CLEVELAND 11, OHIO

LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

LATEST PRICE LIST
Webber Gage Blocks

STANDARD STEEL BLOCKS B Accuracy — .000008"	
84B-84 block set	$235.00
43B-43 block set	150.00
38B-38 block set	155.00
STANDARD CARBIDE (CARBLOX) B Accuracy — .000008"	
82B-82 block set	$1,175.00
33B-33 block set	495.00
Carblox Wear Blocks .100" set of 2 with case	21.50
For price list on Standard Steel and Carbide "A" blocks (accuracy — .000004") or special blocks, write or wire.	
ANGLE GAGE BLOCKS	
16A-16 blocks	$450.00
HEAVY DUTY GAGE BLOCKS AND FIXTURES Accuracy — .000005"	
36 H.D.	$450.00
24 H.D.	385.00

WEBBER GAGE COMPANY
12901 Triskett Road • Cleveland 11, Ohio

E. F. Essner, executive in charge of shops and facilities at the San Francisco yard of Bethlehem Steel Co. shipbuilding division, retired Aug. 1 after almost 50 years of service with the company.

L. B. Dobbins has been named supervisor of plant engineering, Air Reduction Sales Co., New York. He was formerly superintendent of the Johnstown tonnage oxygen plant.

E. E. Goehringer has assumed sales and engineering responsibility in the Indianapolis area as district manager for The Lincoln Electric Co., Cleveland. **Omer Blodgett** has been transferred to the Lincoln Chicago office, with a special assignment in that area in engineering applications for redesigning to welded steel fabrication. **R. L. Hall** and **Robert Hirsch** have been assigned as district engineers to Lincoln's Pittsburgh office.

Business Items

E. W. Bliss Co., Toledo, is renewing its activities in the manufacture of Bliss semi-automatic container-making machinery. This machinery will now be designed, manufactured and served from Bliss' Hastings, Mich., plant.

Sundstrand Machine Tool Co., Rockford, Ill., has purchased the Rockford Magnetic Products Co., to be operated as a subsidiary under the name of Sundstrand Magnetic Products Co.

Borg-Warner automotive replacement parts will be distributed throughout Canada by B-W-H Service Parts, Ltd., of Merritton, Ontario. The Canadian company is arranging to take over the Borg-Warner parts inventory of Acton Machine Co., Toronto.

Armco Steel Corp., Middletown, Ohio, will begin construction of a new $12 million steel making plant which can produce 400,000 tons of steel ingots per year, just south of Armco's big East Works plant. The new plant will consist of three 225 ton open hearth furnaces of the latest design together with several miles of railroad tracks, pipe lines, high tension lines and other equipment.

Burrell Technical Supply Co., Pittsburgh, has changed its name to Burrell Corp.

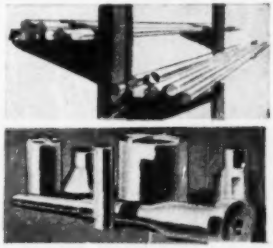
Hartford Special Machinery Co., Hartford, Conn., has purchased the special drilling machinery line formerly manufactured by Langelier Mfg. Co., Cranston, R. I., and has also bought the rights to manufacture an automatic thread roller machine and a die polishing machine.

AXELSON FIRST CHOICE

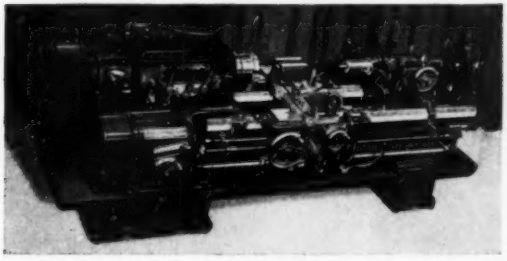
SHOP SUPERINTENDENTS AGREE that machinists produce more work of higher quality with fewer rejects on AXELSON engine lathes, because of their infinite ease of operation, greater versatility, and in-built precision. Control of manufacture... from foundry to assembly... makes this possible.

MORE PRODUCTION PER MAN-HOUR results when a job goes on an AXELSON lathe... machinists actually like to operate them... location of controls minimizes lost motion... extreme rigidity permits faster speeds... ample smooth power for the deepest cut without slowdown.

GREATER ACCURACY MEANS FEWER REJECTS... Massive bed designed to maintain absolute alignment... spring tension scrapers and felt wipers on carriage prevent dirt and chips from galling the ways... operator has complete, precision control of the cutting at all times.



ADAPTABLE TO ANY STOCK, JOB OR TOOL... Wide range of speeds and feeds... two-speed tailstock is standard equipment... with ram type turret, power rapid traverse, micrometer carriage stops, relieving and taper attachments, and many other accessories available for handling any work... designed to use all modern tooling.



MINIMUM MAINTENANCE AND REPAIR... Easier to tool-up and retain precision settings... forced-feed lubrication to carriage and cross slide ways, eliminates wear – gibbed slides permit easy compensating adjustments... all parts designed for longest life with the least maintenance.

AXELSON *Lathes*

FREE

TO PLANT EXECUTIVES: *Complete illustrated literature tells the story of* AXELSON *lathes. Write today for your copy.*

DEPENDABLE FOR A THIRD OF A CENTURY

AXELSON MANUFACTURING CO.

Los Angeles 11 • New York City 7 • St. Louis 16

AUTHORIZED DISTRIBUTORS IN ALL PRINCIPAL INDUSTRIAL CENTERS

For production economy and great adaptability use the Gairing type "C" tool holder, especially for carbide tipped cutters and all heavy-duty work, where short shank and quick-change interchangeable cutters have proved impractical.

Type "C" cutters are always perfectly aligned by tapered shanks and positively driven by hexagon heads. Either held by the friction of the taper or further secured by a threaded pilot, vibration and chatter are entirely eliminated.

Made in five sizes, the type "C" holders will take:

1. *Counterbores* in standard sizes from ¼- to 5-inch diameters, with pilots from ⅛ to 3; also standard countersinks and core drill cutters.
2. *Carbide tipped counterbores* in standard sizes from ⅝- to 2½-inch diameters.
3. *Special production cutters* in unlimited variety, some of them shown here—high speed steel and carbide tipped stepped and multi-diameter cutters, reamers, hollow mills, form cutters, and their various combinations; also inserted blade cutters.

The Gairing Tool Company, Box 478, Detroit 32, Mich.

To get acquainted with our various lines of standard and special end-cutting tools request our Condensed Catalog, listing our representatives throughout the U.S. and Canada.

Federal Machine & Welder Co., Warren, Ohio, will consolidate operations of the Warco Press Division and the Welder Division in its Plant No. 2 in Warren. The move involves vacating the plant formerly known as the Warren City Mfg. Co. which has been engaged in the manufacture of the Warco press line.

American Machine & Foundry Co., New York, has obtained exclusive selling rights in the U.S. to textile machinery manufactured by Titan, Ltd. of Copenhagen, Denmark. Titan's line consists of two products, the Titan Automatic Warp-Tying Machine and the Titan Automatic Heald Indicator. Sales of the line have been assigned to AMF's Stitching Machine Division.

Sauerman Bros., Inc., Chicago, is constructing a one-story crane-type building of approximately 34,000 sq ft in Bellwood, where the company will continue to manufacture excavating and conveying machinery for quarries and mines.

Youngberg Tool & Mfg. Co., Chicago, has completed its new factory building in Schiller Park.

Columbia Tool Steel Co., Chicago Heights, Ill., has opened a new sales office and warehouse at 5118 Easton Ave., St. Louis, Mo.

Michigan Tool Co., Detroit, has appointed Dolan Industrial Sales, Houston, Texas, as representatives in southern Texas.

G. A. Gray Co., Cincinnati, has appointed the following firms as exclusive distributors for its entire line of machine tools: The Ford Machinery Co., Toledo, for northwestern Ohio; Frank T. Goetz Machinery, Inc., Cleveland, for northeastern Ohio; Martin Supply Co., Tulsa, for Oklahoma; Hoffman & Heartt, Los Angeles, for southern California.

East Coast Aeronautics, Inc., has moved factory and offices to new and larger quarters at 896 South Columbus Ave., Mt. Vernon, N. Y.

Tube Turns, Inc., Louisville, Ky., has moved its Los Angeles branch office to Suite 447 in the General Petroleum Bldg., 612 South Flower St.

Elmes Engineering Div. of **American Steel Foundries** has moved all departments from Chicago to 1150 Tennessee Ave., Cincinnati.

Carnegie-Illinois Steel Corp. and **National Tube Co.**, U.S. Steel subsidiaries, will construct new sintering plants at five Pittsburgh and Chicago district steel plants to process powdery iron ore to usable size and to recover iron from blast furnace flue dust.

Balanced load!
TWIN POST MOUNTING
Means Accuracy
IN TOP-SPEED MILLING
Kent-Owens Machines do your milling right—with speed and accuracy that means greater production, fewer rejects, lower costs! The head is mounted on two cylindrical ground steel posts which carry the spindle midway between them—an exclusive Kent-Owens feature! No overhang—no cocking action. It's extra rigid . . . practical . . . dependable. Write for bulletins on wide range of hydraulic and hand-operated machines. Kent-Owens Machine Co., Toledo, Ohio.
Call on
KENT-OWENS
for Milling Machines
No. 1-14
Milling Machine
32" x 9" table
14" table travel

LESS LOSS

with D. A. Stuart

CUTTING FLUIDS

A CHANGE in cutting fluids frequently makes a very big difference in production costs. Here is an authenticated "before and after" report at a plant turning, drilling, facing, reaming and tapping forgings, SAE equivalent 1315 with a trace of chrome, nickel and moly:

1. **SCRAP LOSS—". . . because of high finish requirements, the percentage of scrap was excessive. Use of D. A. Stuart's SOLVOL reduced scrap losses to the minimum."**
2. **TOOL LOSS—"Overall tool life was increased 50% by SOLVOL as compared to the best of other cutting fluids tried."**
3. **TIME LOSS—"Floor-to-floor machining time was decreased 14% after application of SOLVOL."**

The combination of D. A. Stuart products and D. A. Stuart service is *reducing losses* for hundreds of plants through less tool breakage, longer time between grinds, less downtime, improved finish, higher speeds and feeds and greater accuracy of work. Write for literature and ask to have a D. A. Stuart representative call.

"Wise Economy Results from Wise Selection of Cutting Fluids"

D.A. Stuart Oil Co.
EST. 1865 LIMITED

2729 South Troy St., Chicago 23, Ill.

Triplex Corp. has completed moving its plant from Chicago to Pueblo, Colo., and production is well under way after installation of over half a million dollars in new equipment. The new Triplex home consists of ten plants, each devoted to a specific phase of manufacturing, research, engineering, storing and shipping. The main plant with eight production lines in full swing will produce in excess of 50,000 pistons daily.

General American Transportation Corp., Chicago, is adding substantially to its machine shop capacity at its principal plant in East Chicago, Ind.

Ward Leonard Electric Co., Mt. Vernon, N. Y., has appointed Central Station Engineering Co., Tucson, Ariz., sales representative in that state.

Hydro-Line Mfg. Co., Rockford, Ill., has appointed the Hydraulic Service Co., Philadelphia, exclusive representative for the Philadelphia area, and Alton J. Fabrey, Scotia, New York, exclusive representative for the western New York territory.

Carboloy Co., Inc., Detroit, has appointed the Pye-Barker Supply Co., Atlanta, Ga., authorized distributor for the Atlanta and northern Georgia area.

Hobart Brothers Co., Troy, Ohio, has appointed Virginia Welding Co., Charleston, W.Va., distributor for most of the counties in that state.

Weston Electrical Instrument Corp., Newark, N. J., and its subsidiary, C. J. Tagliabue Corp., have established a district sales office at 6230 3rd St., N.W., Washington, D.C. The new office will serve the District of Columbia and adjacent counties.

The Electric Industrial Truck Assn., has moved from Long Island City, New York, to the Beury Bldg., 3701 North Broad St., Philadelphia.

Perfection Stove Co., Cleveland, has purchased Standard Gas Equipment Corp., Baltimore. Tools, dies, and molds will be moved from Baltimore to Perfection's Ivanhoe Road plant in Cleveland.

Electro-Chemical Supply & Engineering Co., Paoli, Pa., one of the oldest firms in the acid and corrosion proofing field, has reorganized. New officers of the company are Dr. C. R. Payne, president; J. Wm. Grant, vice president and sales manager; Wm. A. Sesher, treasurer and production manager; Walter L. Sheppard, Jr., export sales manager and advertising manager. In addition to existing facilities, a new plant with 16,000 square feet of floor space is being fully equipped at Emmaus (Allentown), Pa.

GREENLEE

AUTOMATIC TRANSFER MACHINE

VIEW FROM LOADING END

PERFORMS 120 OPERATIONS

STATION 1 — Load and Turn Over 180 Degrees		
LEFT HAND UNITS	RIGHT HAND UNITS	
STATION 2		
Drill 12 Holes Drill & Chamfer 2 Holes	Drill 14 Holes	
STATION 3		
Drill 7 Holes	Drill 10 Holes	
STATION 4		
Drill 3 Holes C'Bore & Chamfer 1 Hole Ream 2 Holes	Drill 2 Holes 11" Deep	
STATION 5		
Drill 4 Holes Ream 2 Holes Chamfer 11 Holes	Drill 1 Hole Ream 2 Holes Chamfer 16 Holes	
STATION 6		
Tap 14 Holes	Tap 17 Holes	
STATION 7 — Unload		
58 OPERATIONS	62 OPERATIONS	

TOTAL — 120 OPERATIONS

FOR PROCESSING CYLINDER BLOCKS

PRODUCES 45 BLOCKS PER HOUR . . . AT 80% EFFICIENCY

This 7-station automatic transfer machine performs a total of 120 individual drilling, chamfering, counterboring, reaming, and tapping operations in a continuous cycle on cylinder blocks for a leading automobile manufacturer. The loading end of the machine is equipped with a turnover fixture that revolves the work 180 degrees, eliminating handling of the piece as it is received from previous machining operations.

Greenlee patented precision-ground individual lead screw spindles tap a total of 31 holes in both ends of the cylinder blocks. All tapping units are provided with a rapid approach and return stroke. Automatic tap lubrication insures clean, precision-cut threads with maximum tool life.

The electrically-controlled hydraulic units are easily accessible for set-ups and for making tool changes, and are designed so they can be independently operated. Ample room is provided between stations for work inspection. Automatic lubrication of each vital moving part assures long machine life and efficient operation.

The experience of Greenlee engineers and the skill of Greenlee manufacturing personnel were combined to produce this machine. The effectiveness of this Greenlee team can be used by you, too, toward the licking of *your* production machinery problems.

PRODUCTION MACHINERY

GREENLEE

Additional Information Available Upon Request

GREENLEE BROS. & CO., 1729 Mason Ave., Rockford, Ill.

DETROIT OFFICE: 504 CURTIS BUILDING, DETROIT 2, MICHIGAN

MULTIPLE SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

JUST PRINTED

Two bulletins showing how

NEW G-E MOTOR EXCHANGE PLAN

cuts machine down time

Get the story of the new time and money saving General Electric exchange plan for Tri-Clad integral-hp motors! It's an extension of the highly successful G-E fractional-hp motor exchange plan and covers most popular types of Tri-Clad open dripproof motors—one to five hp. Bulletin GEA-5189 is for motor users; Bulletin GEA-5180 is for machinery manufacturers. Write on your letterhead FOR FREE COPY: *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

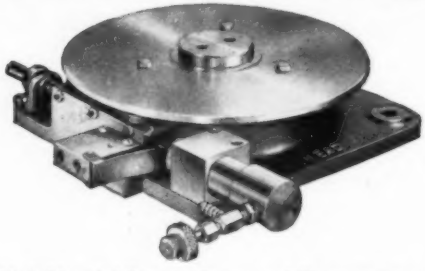
Look for this extra on the motors you buy; it means lower maintenance costs, less time lost for motor replacement.

GENERAL ELECTRIC

106-3

Air Operated

ROTARY WORK FEEDER



Deftly holds and delivers small parts to drill, tap, swage, stake, etc. Stations accurate to .002". Guaranteed against over-travel or "skipping." Indexes as slow or fast as you like, up to 10,000 per hour. Compact and sturdy, easy to tool and hook up.

Standard dial plate 10"; available in 12". For a new job, simply tool up a new dial. Readily combines with "MEADMATIC" Timer, Air Hammer, Air Press, Drill presses, etc.—to make almost completely automatic machine—operator merely loads.

Write for full details.

MEAD SPECIALTIES COMPANY

4114 NO. KNOX AVE., DEPT. MA-99, CHICAGO 41, ILL.

L. S. Starrett Co., Athol, Mass., has purchased Burrill Saw & Tool Works, Ilion, N. Y. Burrill's "Paramount" band knives and band saws are now being manufactured by Starrett in the Athol plant and are being marketed under the Starrett name.

Ferracute Machine Co., Bridgeton, N.J., has appointed C. R. Terry Machinery Co., Cleveland, as agent representing the Ferracute line of power presses in northeastern Ohio, including the Cleveland area.

A. S. Campbell Co., Inc., Boston, has purchased Rollins Engine Co., Nashua, N. H. The new company will be known as Rollins Engine & Machine Co., Inc. The Rollins firm was founded in 1853 to manufacture steam engines. In more recent years it has developed and manufactured special purpose machinery.

American Swiss Co., Toledo, has sold its automotive stamping and door lock business to Standard Products Co., Cleveland. American Swiss's Fernwood Ave. plant which was not involved in the deal is operating normally with 500 employees. Output is going to Standard Products.

Smith & Mills Shaper, Inc., Hamilton, Ohio, has been organized and chartered to manufacture shapers and tools. Incorporators are John R. Bullock, Robert Taft, Jr., and Leonard A. Weakley.

Kaiser Company, Inc., Oakland, Calif., has changed its name to Kaiser Steel Corp. The company operates six rolling mills, with two more to be added by the end of the year.

Armstrong Metal Products Co., London, Ohio, long an affiliate of McCord Corp., Detroit, has been purchased by McCord. The London plant produces radiators for popular-make automobiles.

Phillips Bros. Screw Products Co., Lansing, Mich., has moved to larger quarters at 2909 S. Logan St.

Cinch Mfg. Corp., Chicago, and the firm's Howard B. Jones Division have moved to a new factory and offices at 1026 South Homan Ave.

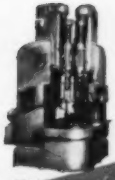
Palmer Mfg. Co., Phoenix, Ariz., has purchased the entire operating equipment of the Naco Mfg. Co., Los Angeles. The Naco firm, formerly known as the Pacific Heating Co., manufactures a complete line of floor furnaces, console and suspended heaters and duct heating equipment.

Wickes Brothers, a division of The Wickes Corp., has opened a factory branch office in the Detroit area.

Model 844
MICROFLAT

Model 705-2
HYDROHONER

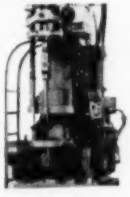
Model 720
HYDROHONER



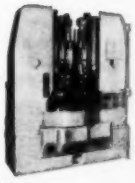
Model 728
HYDROHONER

Model 523
HYDROHONER

YOUR BEST MOVE *to cut your costs!*



GAGE BAR MICROSIZE
Single Spindle

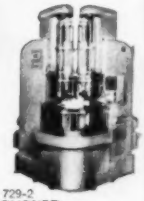


Model 726-3
HYDROHONER

Model 818
MICROFLAT

Model 718
HYDROHONER

GAGE BAR MICROSIZE
V-8 Multi-Spindle

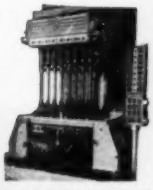


Model 729-2
HYDROHONER

Completely finished bores of uniformly accurate geometry—final size—final surface finish—are generated in only one or two rapid stock removing operations by Micro-honing; no further machining is necessary!

Our twenty years of honing progress have produced these machines which are cutting costs for many manufacturers. They can help cut your costs, too! Let's explore it!

Model 821-2
MICROFLAT



GAGE BAR MICROSIZE
Multi-Spindle

Model 844-2
MICROFLAT

Model 604
HYDROHONER

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT • DETROIT 4, MICHIGAN

DISTRICT FIELD OFFICES

1323 S. Santa Fe
LOS ANGELES 21, CAL.

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BRANTFORD, ONT., CAN.

MICROMOLD MANUFACTURING DIV.
GUILFORD, CONN.

Precision
Rod Cutting
at High Speed

with the New
DI-ACRO ROD PARTER

"PARTS OFF" MANY MATERIALS
All hot and cold rolled rods
Stainless steel
Chrome Molybdenum
Aluminum Brass
Copper Bi-metals
Many types of plastics
Fibre Rubber
Wood

The DI-ACRO Rod Parter further increases the applications of "DIE-LESS DUPLICATING" as a cost-cutting, time-saving production technique so well established by DI-ACRO Precision Benders, Brakes and Shears.

Do you require precision?—The DI-ACRO Rod Parter holds tolerance to .001" on duplicated cuts. The ends are square, and roundness is maintained.

Do you want speed?—The Rod Parter exceeds output of other methods with equal accuracy, on rods and bars up to ⅝". Torrington Roller Bearings incorporated in an exclusive multiple leverage arrangement provide remarkable ease of operation in both heavy and light materials.

GET "DIE-LESS DUPLICATING" CATALOG

Shows parts produced without die expense by DI-ACRO Benders, Brakes, Shears, Rod Parters, Notchers, Punches. Send for your free copy.

Pronounced "DIE-ACK-RO"

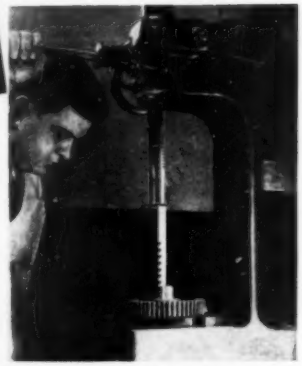
DI-ACRO DIE-LESS DUPLICATING

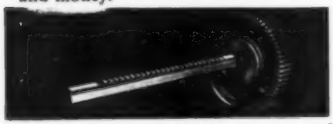
O'NEIL-IRWIN MFG. CO.
311 EIGHTH AVENUE • LAKE CITY, MINNESOTA

CUT 100 KEYWAYS FOR AS LITTLE AS $8.25

That's the cost of the du Mont *Minute Man* Keyway Broach and Bushing for one keyway size.

If you have a variety of keyways to cut in gears, milling cutters, pulley hubs, collars, couplings, etc., a *Minute Man* Keyway Broach Kit will pay for itself many times over. With it you can hand cut any standard width and depth of keyway in *sixty seconds*. It saves you minutes and money.





Now Available
***Minute Man* Production Type**
Keyway Push Broaches

for multiple production of keyways in moderate quantity — using either hydraulic or hand arbor press. In keyway widths from 1/32" to ¼", for any desired hole diameter. Write for prices.

CLIP THIS COUPON, NOW

The du MONT CORPORATION
Greenfield, Mass.

Please mail me Descriptive Folder and Price List

Name .....

Company .....

Address .....

Clearing Machine Corporation, Chicago, has appointed Harrington, Wilson and Brown, New York City, as sales representative for its new line of inclinable presses in the New York City and the eastern New York areas. The R. L. Crane Machinery Co., Buffalo, N. Y.; F. W. Schiefer Machinery Co. Rochester, N. Y.; and J. F. Owens Machinery Co, Syracuse, N. Y., will sell Clearing's new line in their respective districts.

Parker Manufacturing Co., Worcester, Mass., has acquired the Ackerman-Steffan Co., Chicago. The Chicago firm will be known as the Ackerman-Steffan Division of Parker Mfg. Co., and will continue to manufacture the same products.

L. A. Young Spring and Wire Corp. has started production on a $1,500,000 plant at San Leandro, Calif.

E. W. Bliss Co., Toledo, is continuing operation of its Eastern Parts Sales and Services administrative offices in New York City, after moving its manufacturing operations from Englewood, N. J., to Hastings, Mich.

Peters Stamping Co. will add 12,000 sq ft of floor space for a shipping room and will install new welding and assembly equipment in the firm's plant at Perrysburg, Ohio.

CALENDAR OF EVENTS

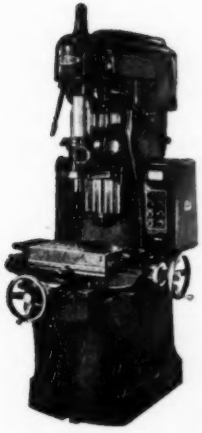
SEPTEMBER 12-16 — Instrument Society of America, conference and exhibit; auditorium, St. Louis, Mo.
12-16—Industrial Engineering Conference; Michigan State College, East Lansing, Mich.
15-16—Magnesium Assn., quarterly meeting; Statler Hotel, Detroit.
21-23—National Assn. of Foremen, annual convention; Statler Hotel, Detroit.
26-28—American Management Assn., personnel conference; Waldorf Astoria, New York.
28-30—American Society of Mechanical Engineers, fall meeting; Lawrence Hotel, Erie, Pa.

OCTOBER 4-6 — Industrial Packaging and Materials Handling Exposition, Detroit.
10-14—American Society for Testing Materials, national meeting; Fairmont Hotel, Mark Hopkins Hotel, San Francisco.
13-15—Foundry Equipment Manufacturers Assn., annual meeting; White Sulphur Springs, W. Va.
13-15—Industrial Management Conference, University of Missouri, Columbus, Mo.
11-14—American Standards Assn., thirty-first annual meeting; Waldorf-Astoria, New York.
17-21—National Metal Exposition & Congress; public auditorium, Cleveland.
24-26—American Gear Manufacturers Assn., annual meeting; Chicago
26-28—National Metal Trades Assn., annual convention; Palmer House, Chicago.
27-29—American Society of Tool Engineers, semi-annual meeting; Mt. Royal Hotel, Montreal.
30-Nov. 2—National Tool & Die Manufacturers Assn., annual meeting; Statler Hotel, New York.
31-Nov. 2 — Packaging Machinery Manufacturers Institute, 17th annual meeting; Edgewater Beach Hotel, Chicago.

"You can't do *today's* job with *yesterday's* tools and be in business *tomorrow*"

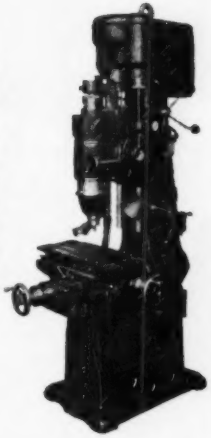
Ben Morell

BEN MORELL, *President*
JONES & LAUGHLIN STEEL CORPORATION

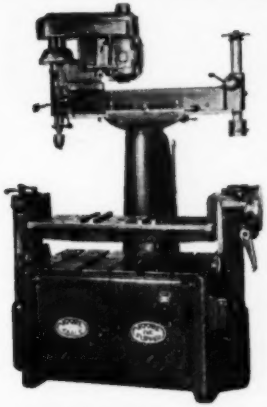


No. 2 MOORE JIG BORER, with its accurate lead screw settings within .0001", offers all the time-proven precision features associated with Moore Jig Borer construction for 15 years, plus numerous labor-saving advantages, including: increased capacity and size; infinitely variable spindle speeds; 3 power feed ratios; centralized controls.

MOORE JIG GRINDER, an important contribution to tool and die-making, meets the growing need for finish-grinding holes to size and location, previously accomplished only by makeshift methods. It eliminates hours of checking on the bench or surface plate to correct holes in hardened parts.



Four ways to cut costs and meet competition by mechanizing your toolroom.



MOORE DIE FLIPPER takes the grunts, groans and wasted motions out of the toolroom. With it one diemaker does the work of three. He can take apart, turn over, drill, tap, try out, and inspect a complete die-set. It's a money saver from the start, for it can also be used as a radial drill.

MOORE PANTO-CRUSH WHEEL DRESSER speeds form-grinding and cuts costs. Both crush-forming and diamond-dressing are accomplished with this 2-in-1 unit permanently mounted on the wheel spindle of a surface grinder. You switch from one method to the other without disturbing workpiece setting

We'll be glad to send you complete descriptive literature on any of these machines.

MOORE SPECIAL TOOL COMPANY, INC.
738 UNION AVENUE, BRIDGEPORT 7, CONNECTICUT

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • COMPLETE LINE OF HOLE LOCATION ACCESSORIES

THAT "Something Extra" YOU GET IN CONTINENTAL CUTTING TOOLS

CONTINENTAL'S engineering knowledge is an important extra you get in Continental cutting tools. Continental's 30 years' experience as designer and manufacturer of a wide range of cutting tools is your assurance of correct design, exactness of manufacture, and greater accuracy and production in operation. Continental products include counterbores, face milling cutters, broaches, and special carbide-tipped tools. Continental can help you raise your production and reduce your unit costs. Call your local representative, or write Ex-Cell-O in Detroit today!

CTW

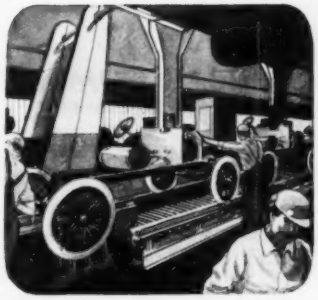
CONTINENTAL TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

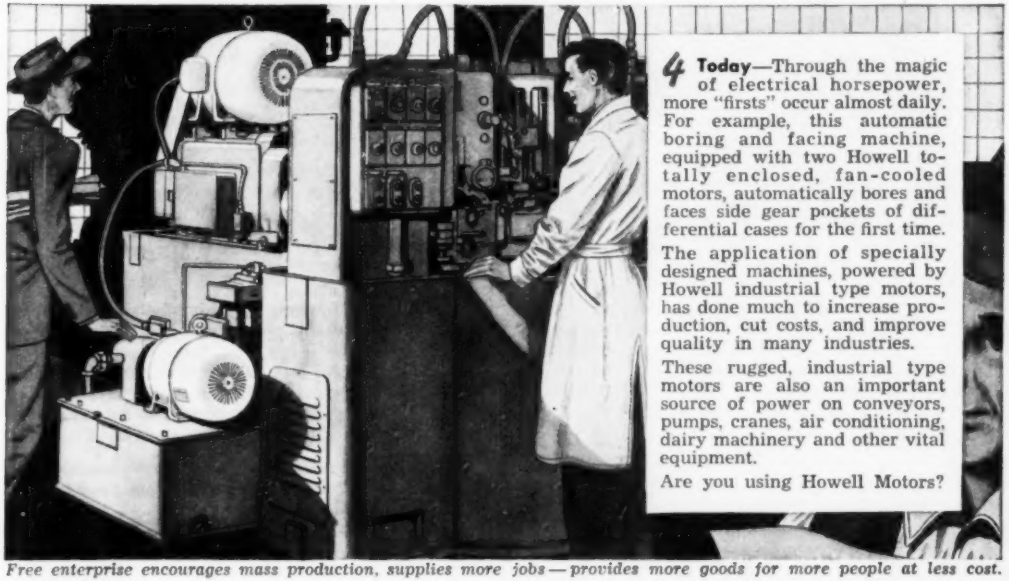
1 **1875**—Wisconsin offered a $10,000 reward to the person who would invent a steam carriage. George Seldon, Rochester, N. Y., was first and collected . . . America's great auto industry was under way.

2 **1892**—First gasoline-driven car was built by Charles Duryea with screw drivers and wrenches. Machine tools to aid this growing industry soon appeared. But parts still had to be assembled by hand.



3 **1913**—First moving assembly line was used in auto plants! Gone, now, was much of the labor of carrying parts. In 1915, Howell "Red Band" Motors appeared and soon were widely accepted in industry.

FAMOUS AUTOMOTIVE FIRSTS! REMEMBER?



4 **Today**—Through the magic of electrical horsepower, more "firsts" occur almost daily. For example, this automatic boring and facing machine, equipped with two Howell totally enclosed, fan-cooled motors, automatically bores and faces side gear pockets of differential cases for the first time.

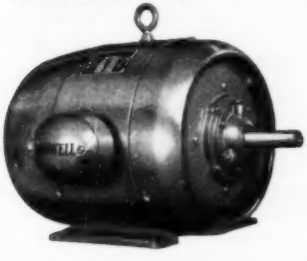
The application of specially designed machines, powered by Howell industrial type motors, has done much to increase production, cut costs, and improve quality in many industries.

These rugged, industrial type motors are also an important source of power on conveyors, pumps, cranes, air conditioning, dairy machinery and other vital equipment.

Are you using Howell Motors?

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.

Howell totally enclosed, fan-cooled motor—windings completely sealed against dirt and weather.



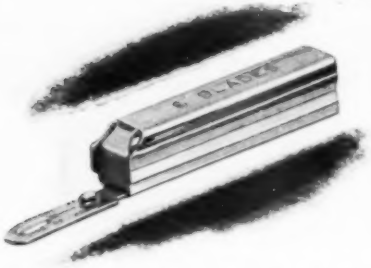
HOWELL MOTORS

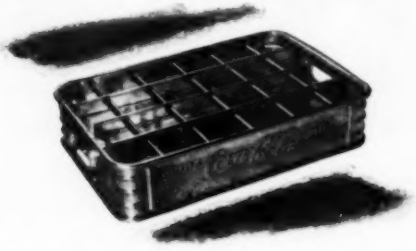
HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

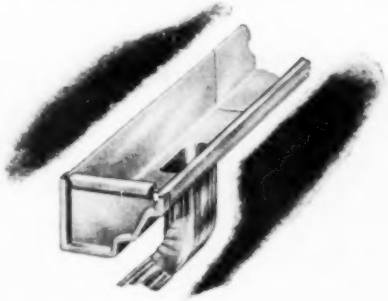
Precision-built Industrial Motors Since 1915

HOWELL Red Band MOTORS

BEAT COMPETITION WITH IMAGINATION ... REDESIGN WITH ALUMINUM







● You're looking at ideas. Each of these redesigned products is a story of lower costs and increased appeal to consumers. That automatic blade changer, for instance, in naturally attractive aluminum eliminates a corrosion-resistant coating operation. The change from brass also provides a substantial material economy.

The beverage case is lighter, stronger, more attractive, now that aluminum serves instead of wood. It is made without bolts, rivets or welds. The cost per trip is lower. And it is easier to keep clean.

Aluminum cable, steel reinforced, is ending a shortage and bringing electric power to thousands of families for the first time. Aluminum costs less than copper and the lighter weight permits longer spans for reduced stringing costs.

Replacing galvanized and copper for gutters and downspouts, aluminum provides the long life of one at a cost comparable to the other. Simple mechanical joints do away with soldering.

Many of the products you see daily can be improved through the use of aluminum. This modern metal lends itself to modern design. Aluminum is ⅓ the weight of ordinary metals, yet it is strong. Every pound purchased offers three times the material for production. It handles faster, gives products a smart appearance. It takes a wider range of finishes than most other metals. But red-rust is never a problem, so finishing cost is frequently eliminated.

Reynolds Aluminum and its many alloys probably have a place in your designs—why not find out now. For the name of your local distributor or nearest Reynolds Sales Office, look under the "Aluminum" listing in your classified telephone directory or write to Reynolds Metals Company, Aluminum Division, 2523 South Third Street, Louisville 1, Kentucky.

ALUMINUM ALLOY DATA

This informative booklet is free when requested on your company letterhead. Just write to address at left.

REYNOLDS *Lifetime* ALUMINUM

CONSIDER ALUMINUM...CONSULT REYNOLDS...THE COMPLETE ALUMINUM SERVICE

ELMES HOBBING *cuts* CAVITY COSTS

Power, plus precision, plus control—that's *Elmes* hobbing presses—in sizes to 5,000 tons, and larger, for sinking hardened hobs into cold steel. It's the modern, *economical* way to produce duplicate die inserts, multi-cavities—even single-cavity molds with hard-to-make contours. Compact Elmes presses, with their rigid three-column design and sensitive control, assure precise, accurate work—whether it's one cavity, or many just alike.

EASY TO USE

Elmes hobbing presses respond quickly and unfailingly. They start at quick-closing speed; change to pressing speed automatically when the hob contacts the blank. *They can be stopped instantly.* Operators have *confidence* in Elmes presses—and that's important, for it encourages exactness, cuts rejects, saves time *and money.*

HYDRAULIC PRESSES FOR EVERY PURPOSE

Whatever your pressing problem, check with Elmes. Objective engineering, backed by *nearly a century* of successful hydraulic experience, makes Elmes presses *right* for each job—for *cutting costs* on long runs or short—for *earning profits.* Write for literature.

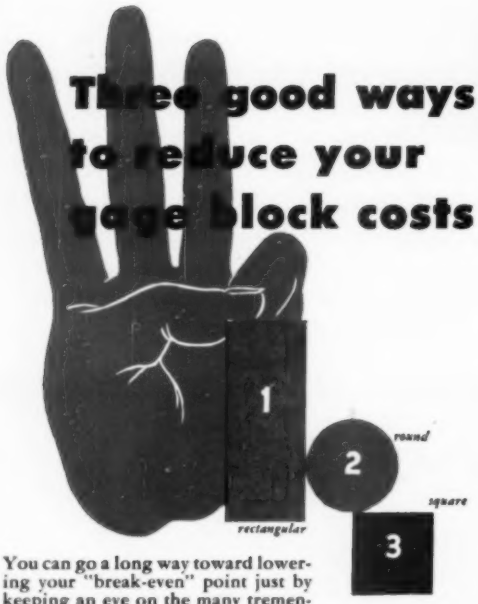
ENGINEERED BY ELMES
Good Hydraulic Production Equipment Since 1851

1500-ton Elmes hobbing press at Reinhold-Geiger, Los Angeles.

ELMES ENGINEERING DIVISION OF AMERICAN STEEL FOUNDRIES, Cincinnati 29, Ohio
Distributors in Principal Industrial Centers • Also Manufactured in Canada

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

Three good ways to reduce your gage block costs



You can go a long way toward lowering your "break-even" point just by keeping an eye on the many tremendous trifles in your manufacturing costs. Take gage blocks, for example. The price you pay for even the best is insignificant compared to the savings they make possible. Assured sustained accuracy of production! More efficient inspection. Fewer rejects. Yet here are three good ways to cut this basic cost of precision:

1 **Get longer wearing millionths with**
ELLSTROM CHROMIUM PLATED GAGE BLOCKS

They give you 5 to 20 times longer wear than ordinary blocks, yet they cost but very little more. Unconditionally guaranteed to specified millionths. Rated "tops" for all-around gage block quality.

2 **Maintain the accuracy of your basic standards through**
ELLSTROM INSPECTION SERVICE

Rejects can raise cain with costs. So it's false economy to let your gage blocks become worn beyond their specified millionths. Let Ellstrom inspect your gage blocks periodically . . . and replace them as required . . . to assure constant "block-by-block" accuracy.

3 **Save up to 20% on new blocks through the liberal**
ELLSTROM EXCHANGE PLAN

When you need new blocks, don't scrap your old ones. Trade 'em in! They're worth up to 20% on the "W" purchase price of new ones under Ellstrom's Exchange Plan.

New ELLSTROM Catalog of Standards!
Contains complete specifications and prices on standard Ellstrom Gage Block Sets . . . plus full details on Ellstrom's Inspection Service and Exchange Plan. Write for your copy today!

Ellstrom... *measuring in millionths for 3 generations*

DEARBORN GAGE CO. 22035 Beech Street Dearborn, Michigan

Originators of Chromium Plated Gage Blocks

ANOTHER DIE CAST PRODUCT MADE BETTER ON KUX DIE CASTING EQUIPMENT

To Make a Better Sharpener... speedier and more economically

AUTOMATIC PENCIL SHARPENER DIVISION

Spengler-Loomis

MANUFACTURING COMPANY

SELECTED KUX

DIE CASTING MACHINES

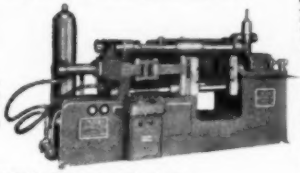
In designing their new Dexter model, the Automatic Pencil Sharpener Company considered appearance, performance and production of equal importance. To assure results as outstanding as the deluxe new Dexter has proved to be, Automatic chose KUX die casting equipment.

The exacting specifications demanded for superior die castings of the sharpeners' base and uprights as well as internal mechanical parts, handle, and centering disc—a total of eight die castings—made the selection of KUX a natural one. Substantial economies of production resulting from the use of KUX machines offered further advantages.

Why not give your product the benefit of such economies and improved die casting techniques?

MODEL BH-30 ILLUSTRATED

Hydraulically operated die casting Machine for production of lead, tin and zinc castings up to 10 pounds.



Write today for illustrated catalog showing complete line of KUX Die Casting Machines.

KUX MACHINE COMPANY
3926 WEST HARRISON STREET
CHICAGO 24, ILLINOIS

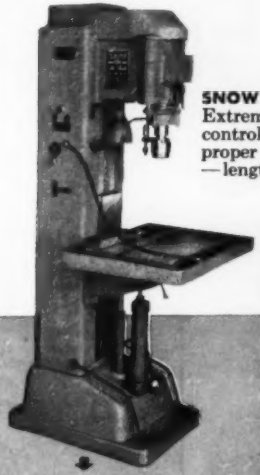
SNOW

FULL UNIVERSAL MACHINES

PRODUCTION OF SMALL PARTS OFTEN TRIPLED

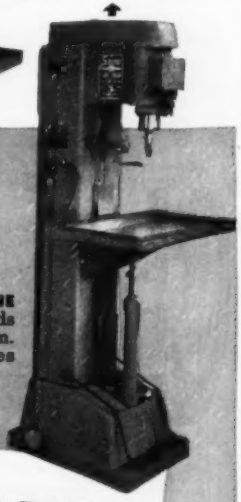
Tomorrow's profits must come from lower costs. "Push Button" machine tools are imperative in today's competition. Snow Drilling, Tapping and Threading Machines are establishing amazing records daily. For faster production at lower cost Snow Machines are unsurpassed–versatile–economical.

AIR-OPERATED, ELECTRICALLY CONTROLLED DRILLING, TAPPING AND THREADING MACHINES



SNOW DRILLING MACHINE—Extremely sensitive pressure control allows drill to establish proper feed—cuts drilling time—lengthens tool life.

SNOW THREADING MACHINE—Produces accurate threads true to lead and thread form. Standard master fixtures minimize handling time.



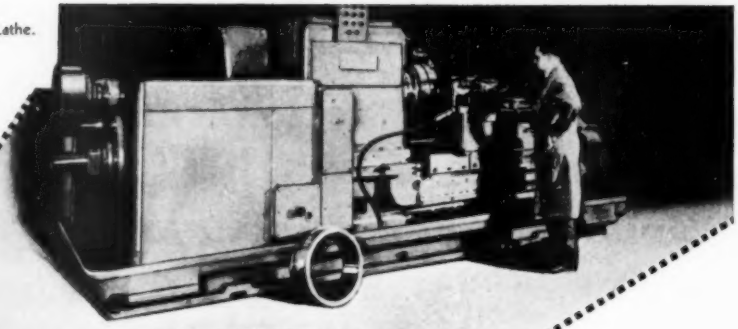
SNOW TAPPING MACHINE—Typical of advanced design and performance is the Snow Full Universal Tapping Machine. Electrical controls allow selection of operation method. Extreme sensitivity to power application prevents tap breakage. Class 3 and 4 fits and production up to 5000 parts per hour are possible. 4 sizes cover range from #0 to ¾" in mild steel.

Snow

HIGH PRODUCTION DRILLING, TAPPING, THREADING, NUT TAPPING, 2 SPINDLE, HORIZONTAL MACHINES, DRILL PRESS TAP HEADS, JIGS AND FIXTURES

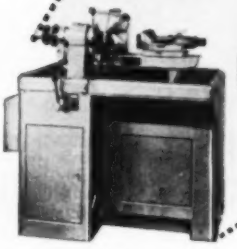
SNOW MANUFACTURING COMPANY 439 EASTERN AVE., BELLWOOD, ILL. (SUBURB OF CHICAGO)

Jones & Lamson 28" Fay Automatic Lathe.
SKF-equipped.



BIG

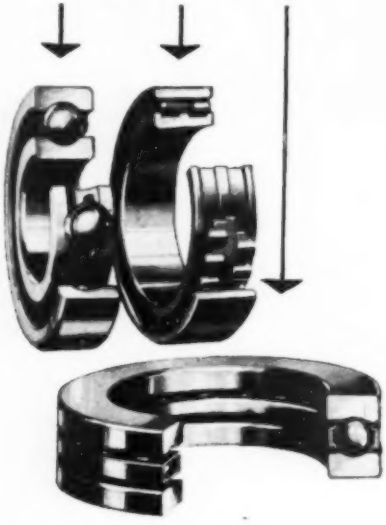
or



little

or in between—
it's SKF anti-friction bearings for modern machine tools

Wade Precision Hand Screw Machine.
SKF-equipped.



Removing 98 pounds of SAE 52100 forged steel in 8 minutes is regular performance for this Jones & Lamson lathe. This tough, exacting job is the machining of inner rings for SKF double-row spherical roller bearings—forming at 330 FPM, turning at 340 FPM. The use of SKF double-row cylindrical and thrust ball bearings gives maximum rigidity at the tool.

SKF Bearings are also standard equipment on the Wade Precision Hand Screw Machine. An SKF double-row cylindrical roller bearing at the spindle nose gives maximum spindle rigidity and accuracy. In combination with a separate SKF precision thrust bearing, deflection or yield is almost completely eliminated.

Here again is specific evidence that for any machine tool—large or small—wherever a shaft turns, there are SKF Bearings especially designed to maintain accuracy at required speeds and loads. For further information concerning SKF machine tool bearings, ask for Catalog No. 272. SKF Industries, Inc., Philadelphia 32, Pa. 6603

Machine Tool Bearings engineered by SKF

CHECK THREAD DIMENSIONS OF YOUR PRODUCT WITH Hanson-Whitney GAGES

Factors to be considered when ordering Thread Gages and reasons why you should specify HANSON-WHITNEY.

LEAD: Thread lead is correct in H-W Gages, therefore tolerances on manufactured products are not partially absorbed by using gages with excessive lead error.

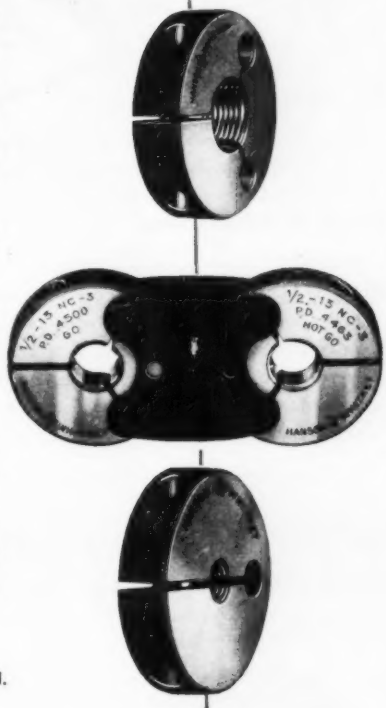
ANGLE: H-W Gages are correct in angle. Angle error plus lead error increase product manufacturing costs. Your gages should be checked for both angle and lead. Both are accurate in H-W Gages.

WEAR: As H-W Gages are held towards the high limit dimensions, you are assured maximum gage life.

MATERIAL: From long experience in gage manufacture, H-W has determined upon grades of material and heat-treating methods that assure the user of long gage wear.

FINISH: Correct and uniform surface finish and hardness—important factors to the gage user—are under careful control in the production of H-W gages.

FINALLY: H-W manufacturing facilities, reputation and experience in producing thread gages are insurance that you are ordering GAGE ACCURACY when specifying HANSON-WHITNEY.



HANSON-WHITNEY MACHINE CO., HARTFORD 2, CONN.
Division of Whitney-Hanson Industries, Inc.

For practical recommendations submit your problems to Hanson-Whitney engineers.

Hanson Whitney

PIONEERS OF FINISHED TAPS

8HW49

Fifth in a series of Unusual Grinding Wheel Operations

Ready for the dotted line!

● Slitting fountain pen nibs to allow for the proper flow of ink is a very exacting operation. This precision job is another example of the versatility of a grinding wheel.

Whatever YOUR grinding problem may be, BAY STATE can solve it . . . fast. Possibly the exact specifications to meet your requirements can be supplied directly from large stocks either in Westboro, branch warehouses, or from our distributors strategically located throughout the United States.

Send us your grinding problems. We can help you.

Photograph of Nib Slotting Operation Courtesy of The Esterbrook Pen Company

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Massachusetts, U. S. A.

Branch Offices and Warehouses—Chicago, Cleveland, Detroit
Distributors—All principal Cities

BAY STATE®

MEMBER OF THE GRINDING WHEEL INSTITUTE

Top Performance Consistently Duplicated

QUALITY—SERVICE

- DRILLS
- REAMERS
- CARBIDE TOOLS
- COUNTERSINKS

Double Circle Tools

For MORE HOLES PER GRIND

Chicago-Latrobe

411 W. ONTARIO ST., CHICAGO 10, ILL.

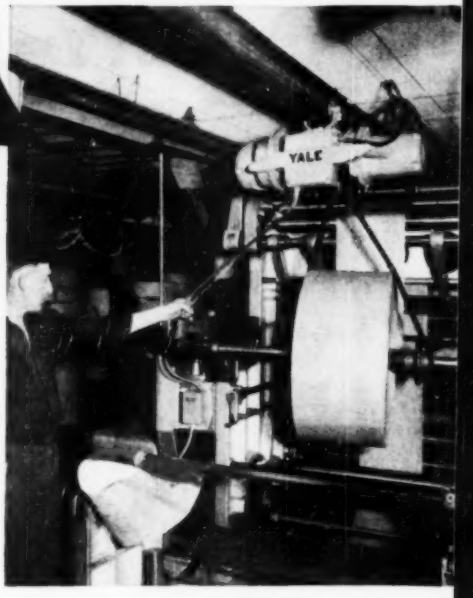
CALL YOUR LOCAL DISTRIBUTOR

IT'S YOUR MOVE... toward lower costs

Efficient motion is the key to efficient production. But no longer can industry confine efficient motion to processing operations. Now *material handling* must be included if you hope to cut costs substantially.

Material handling takes a 30% slice out of every production dollar. To reduce that cost thousands of companies are already using Yale Material Handling Machinery. For example, $300 is saved on each press produced by a manufacturer in Ohio by using Yale Hoists. A grocery warehouse spent $44 to unload a box car until a fork truck was purchased. Then the cost dropped to $7. In another case a company gave up counting parts by hand and now uses a Yale Scale to count by weight. Result: greater accuracy and many hours saved each week.

You want lower costs and you want them now. Our nearby representative will gladly give you the benefit of his broad experience in saving time, effort and money for all kinds of businesses. It's your move! Phone him—or write direct to Yale.



YALE
TOOLS THAT KEEP INDUSTRY "ON THE MOVE"

THE YALE & TOWNE MANUFACTURING CO.
Department L-64 • Roosevelt Boulevard • Philadelphia 15, PA.

YALE

MATERIAL HANDLING MACHINERY • *hoists . . hand and electric • trucks . . hand lift and power • industrial dial scales*

ONE KIT DOES THREE JOBS!

$126.50
COMPLETE
(As Illustrated)

1 ***DRIVES and REMOVES*** **nuts, bolts, cap screws up to ⅜" thread size. Hammers frozen, stubborn fastenings loose with thousands of powerful blows per minute.**

2 ***DRILLS*** **holes in a jiffy up to ½" diameter in steel.**

3 ***TAPS*** **holes with thread sizes from No. 10-32 to ½"-13.**

SCREWDRIVING and STUD REMOVING **attachments available at slight extra cost. The ideal Kit for maintenance and repair work!**

NEW!

Black & Decker ⅜" Electric IMPACT WRENCH KIT

Includes powerful, lightweight Black & Decker ⅜" Electric Impact Wrench, with ½" square drive shank • Chuck for Drilling and Tapping, complete with open-end wrench and hex-key • 6 Hexagon sockets, sizes from ⅜" to ⅞" across flats • Sturdy convenient all-steel carrying Kit.

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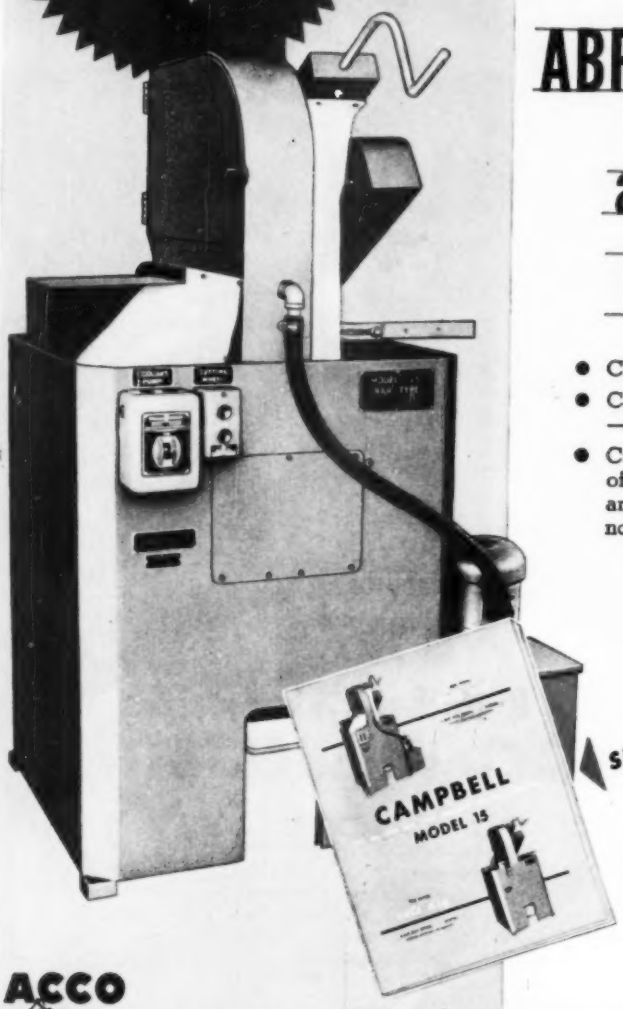

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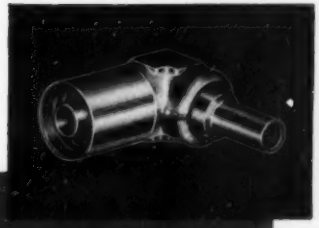
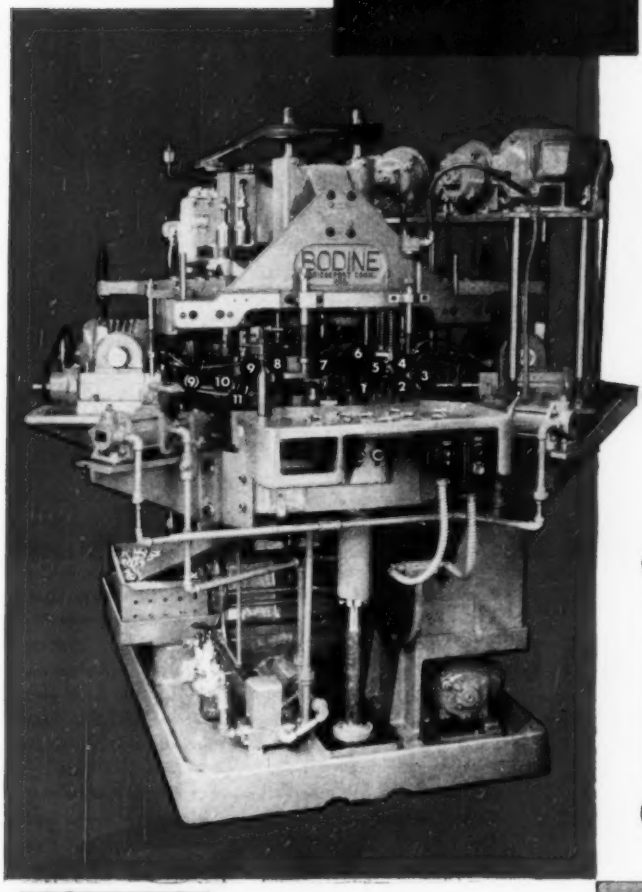
Bodine CASE HISTORY NO. 25

Processing a Forged Brass Tube Connector

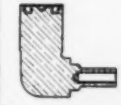


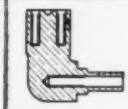


1. Hand load forging to clamping fixture dial.
2. Center forging in fixture, automatically clamp (air cyl.).

3. Hollow mill two diameters, face & center end—Horiz. Drill Spdl.

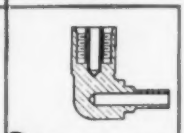
4. Face large end, chamfer & spot drill — Vert. Drill Spdl. Drill .176 dia. hole to half depth — Horiz. Drill Spdl.





5. Trepan to 1/2" depth — Vert. Drill Spdl. Drill .176 dia. hole to 1-3/16" depth — Horiz. Drill Spdl.

6. Tap trepanned recess 1/2 x 12 — Vert. Spdl.



7. Drill 13/64 hole to half depth — Vert. Drill Spdl.

8. Hollow mill large O.D. and finish drill 13/64 hole (combn. tool) — Vert. Drill Spdl.

9. Ream .176 dia. hole 1-3/16 deep — Horiz. Drill Spdl. Remove chips from trepanned cavity — Vert. Drill Spdl.

10. Automatically unclamp (air cyl.).

11. Automatically Ejects.

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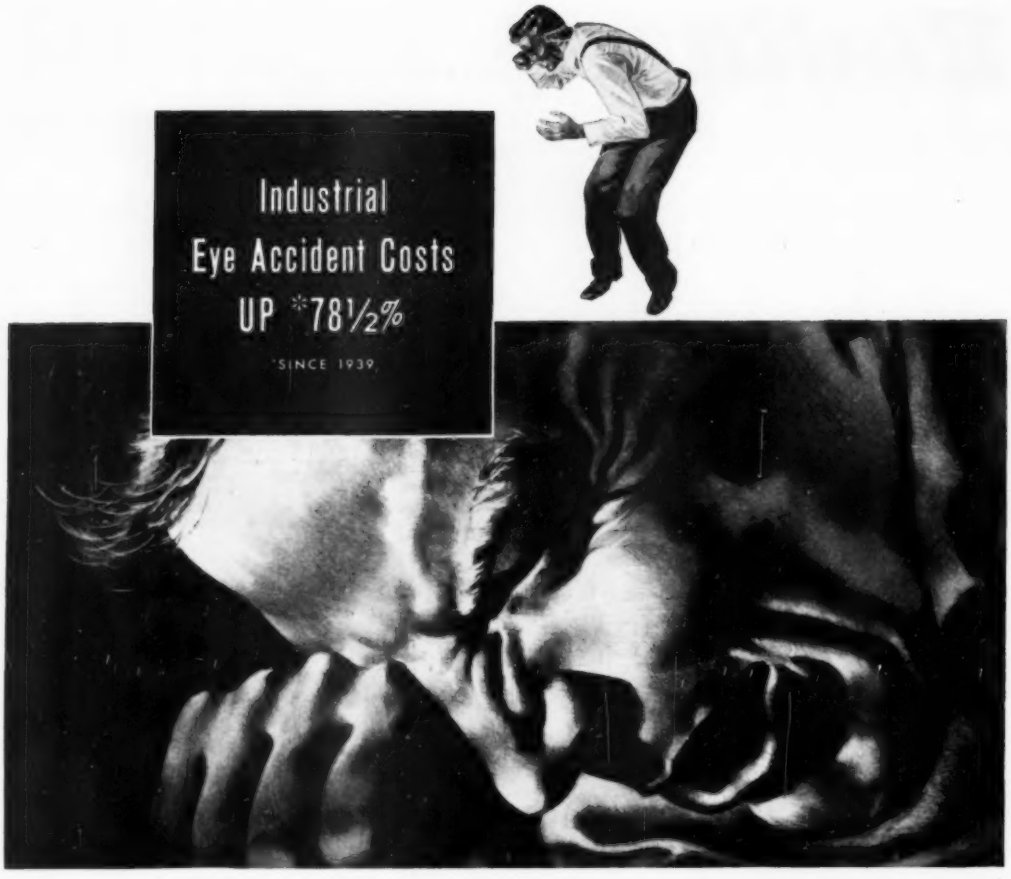

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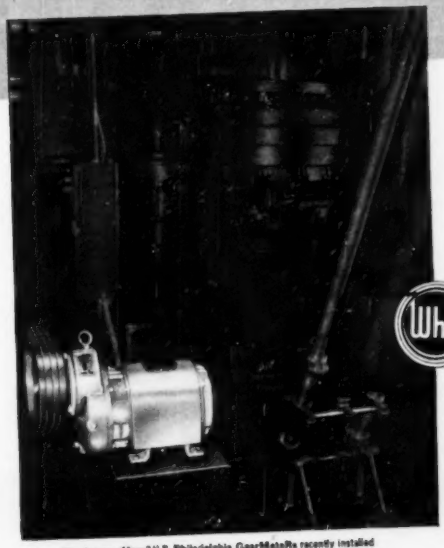

Above: Showing one of four 3 H.P. Philadelphia GearMotoRs recently installed by the R. M. Hollingshead Corp., Camden, N. J. Motor speed—1750 R.P.M.; output speed—350 R.P.M.; Reduction ratio is 5:1. Driving a square can seamer.

Above: Showing one of two 1 H.P. Philadelphia GearMotoRs installed in the Front Royal Plant of American Viscose Corp.-Motor Speed—1750 R.P.M.; output speed—175 R.P.M.; Reduction ratio is 15:1.

Here are some of the reasons why the **Philadelphia GearMotoR** is being used by hundreds of companies throughout industry: It is a self-contained, extremely compact unit that conforms to recommended standards of A.G.M.A. and N.E.M.A.; it is available in single, double and triple reductions . . . and the range of speeds run from 780 through 7.5 R.P.M.; motor rating from 1 H.P. through 60 H.P. . . . A-c or D-c. Motors are precision-built and fit perfectly with gear unit. Gears are of the helical type, long-lived and quiet in operation; made of quality alloy steel, precision machined (teeth shaved) and induction-hardened. Assembly is very simple: Motor and gear units are each self-contained, yet readily separated; gears in multi-reduction units may be inspected without uncoupling from driven machine. Lubrication is of the positive "splash type," with large reservoir. Gear housing is leak-proof, and motor, which is greased independently, has double-shielded ball bearing design.

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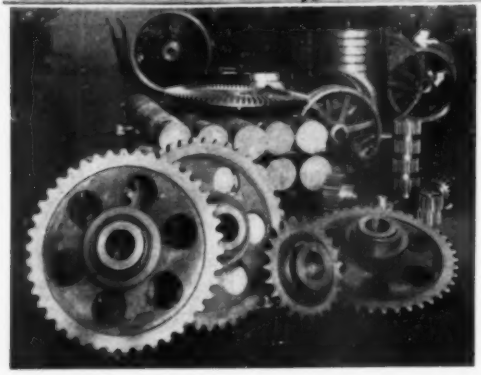

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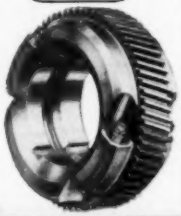

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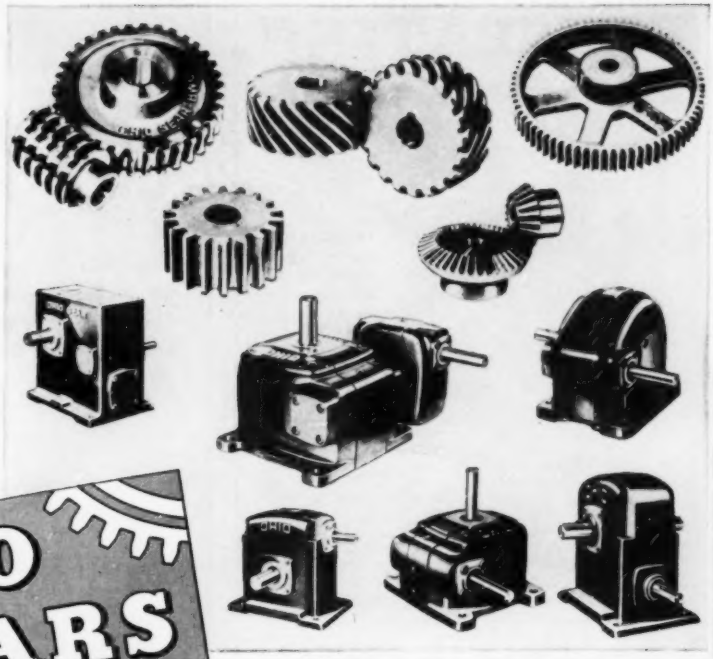

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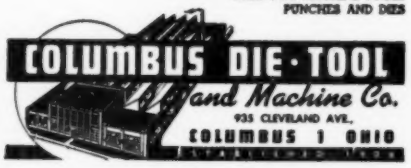

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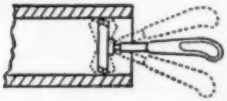


Operates by tilting handle, without force. Whether handle drops freely or not is the definite yes-or-no indication.

This new illustrated folder will tell you more about the cost saving features of DuBo Gages. Yours for the asking.

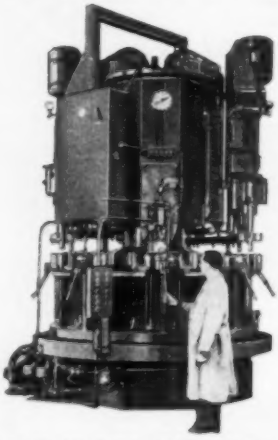
*U. S. and Foreign Patents Granted

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

How to Combine Machining Operations in Less Floor Space

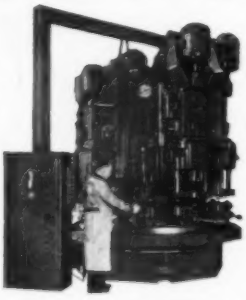
Here are two interesting examples of high production machining in relatively small floor space. Rather than string each operation out in a long line with conveyors, the operations are performed in fixtures held on a rotary indexing table.

5 OPERATIONS ON 240 PARTS PER HOUR IN 79 SQ. FEET . . .



This type VSI vertical indexing drilling machine is designed for drilling, reaming and chamfering five bolt holes and drilling and chamfering one 18" hole in automotive rear axle.

4 OPERATIONS ON 130 PARTS PER HOUR IN 84 SQ. FEET



This type VSI special vertical automatic indexing machine is provided with eight two station fixtures for holding one each right and left hand spindle assembly supports. Operations include drilling, reaming, chamfering and sawing. While each head is hydraulically actuated, on the machine illustrated, electrical mechanical heads are also available.

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Ask for bulletin 160.

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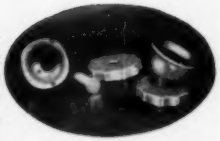
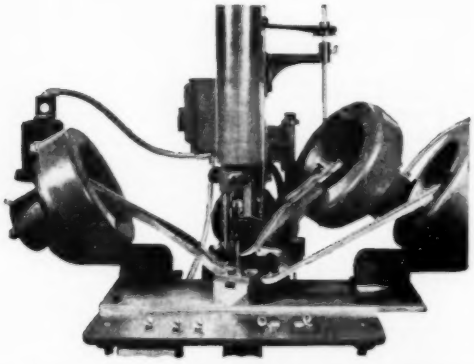


To assemble three parts: Screw, Bale Cup and Lock Nut for fuel pump sediment bulb . . . Formerly done by hand and then welded one at a time to the bale wire. One operator by hand method could assemble only ten to fifteen a minute.

THE SOLUTION:

By using a DETROIT POWER SCREWDRIVER, the machine will AUTOMATICALLY assemble up to 30 units a minute, increasing over-all production 200% to 300%. By hand method, it would require 3 operators and 3 welders to match that record . . . All component parts are automatically fed from hoppers directly to positioning fixture . . . The machine automatically cycles and drives the screw by means of friction, as it is a slotless screw. Completed assembly is ejected beneath the table and carried to the welding operator.

WHAT IS YOUR PROBLEM? Send sample assembly for estimate and catalog.



DETROIT POWER SCREWDRIVER CO.
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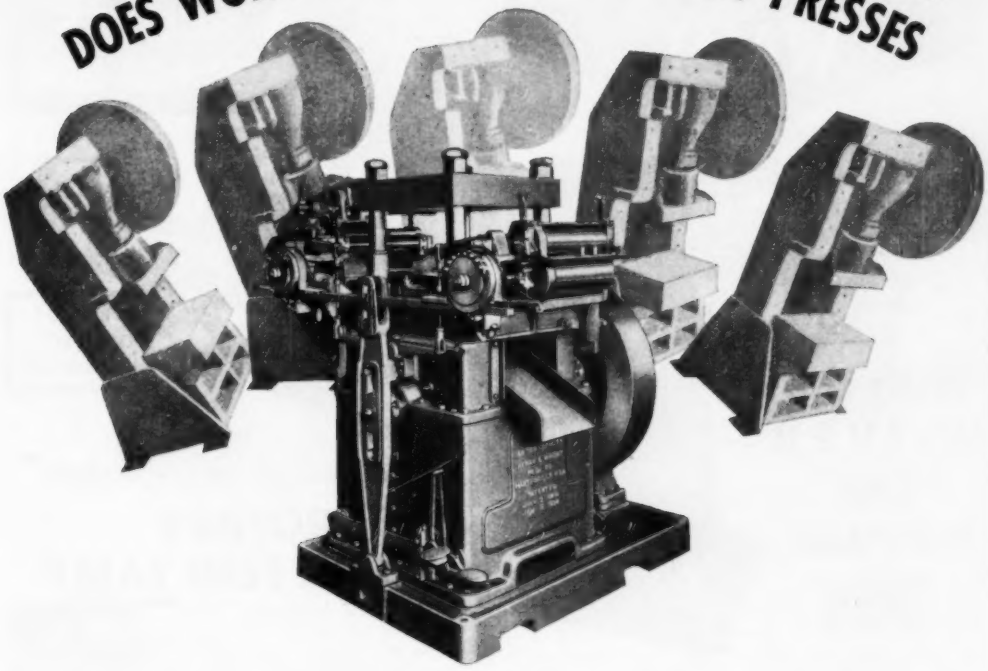
ONE HENRY & WRIGHT DIEING MACHINE DOES WORK OF 5 TO 10 ORDINARY PRESSES



Complete-per-stroke production on Henry & Wright Dieing Machines is the modern, cost-saving method of fabricating simple and complex stampings. Instead of a series of interrupted operations, you get the job completed on one machine. One Henry & Wright Dieing Machine customarily does the work of 5 to 10 ordinary presses.

Your die investment is protected, too, because our machines are designed to have the lower crosshead absorb the angular thrust of the crankshaft — it is not transmitted to the punch-carrying member. This improvement increases die life up to 1200% and it means more pieces between grinds. Get complete details on Henry & Wright Dieing Machines. You may save as much as 60% to 90% on your stamping costs. Write for catalog 49. If you wish, we can have a technical representative pay you a visit.

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- Die Life Increased up to 1200%
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- Capacities 10 Tons to 500 Tons
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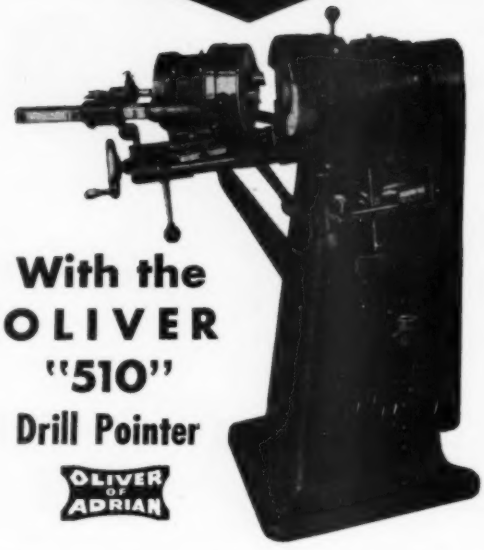

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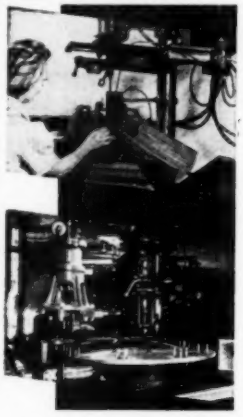
CUTS DRILLING COSTS 50% OR MORE

Bellows *"Controlled-Air-Power"* ROTARY WORK FEED TABLE



EVERY second the spindle stands idle to load or unload parts in the jig or fixture it costs you money.

With the Bellows Rotary Work Feed Table you can feed 4, 6, 8, 12, or 24 loaded jigs to the spindle automatically and at speeds ranging from 54/100ths of a second to 17/100ths of a second.

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The Bellows Co.
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● A blueprint of the farm implement suspension crank forging illustrated above was recently brought to us with the request that we try to develop a good method of forging it.

Our engineering staff and tool and die designers "teamed up" to apply their forging know-how and developed a series of operations to produce a high quality forging at a high rate of speed, having a minimum amount of evenly distributed flash, in spite of the large difference in the stock requirement of the various sections over its length. This was accomplished by teaming a 4" National High Duty Forging Machine with a National No. 6A Maxipres.

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THIS DOOR IS ALWAYS OPEN

Our engineering staff, in fact our entire organization is always at your service. Send us blueprints; a sample of the part you wish to make, or better yet, visit us. Chances are, we can help you solve your forging problem.

75th Anniversary 1874-1949

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET, AND WIRE NAIL MACHINERY

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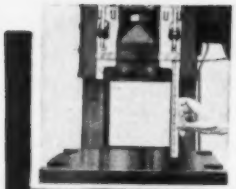
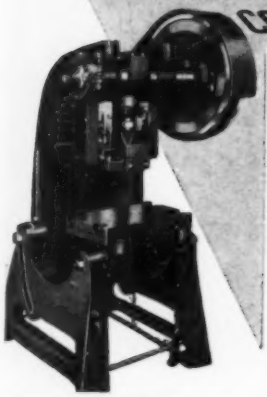


GREATER SHUT HEIGHT
OF
PRESS-RITE
PUNCH PRESSES

CUTS PRODUCTION COSTS



SAVE valuable time by providing more room for faster die changes and easier set ups—especially important on short run stampings where speed is essential for profit.

PROVIDES LARGER DIE SPACE for heavier, bulkier dies—permits greater flexibility in press operation—saves use of heavier presses for low tonnage bulky dies when smaller presses will do the job efficiently.

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5 TO 30 TONS CAPACITY

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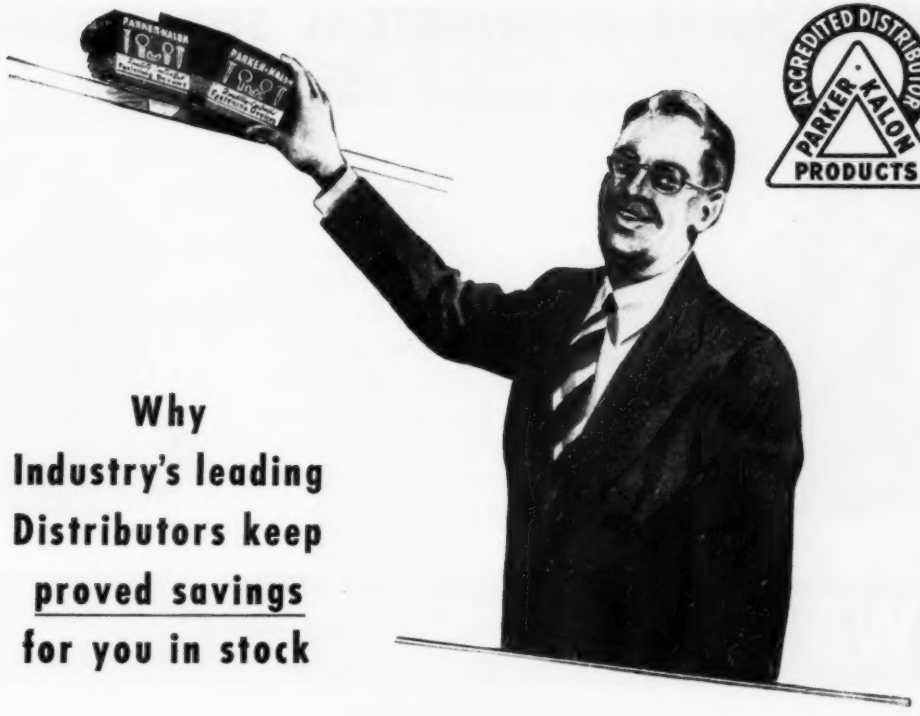

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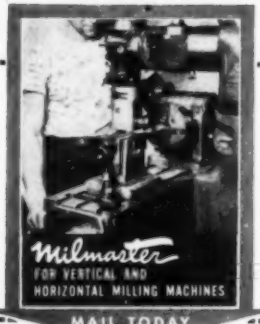

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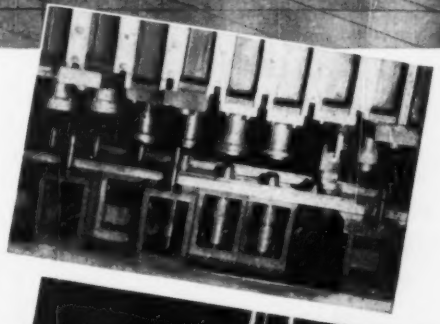

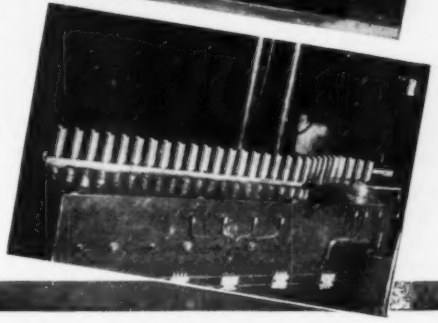

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completely improved for greater efficiency

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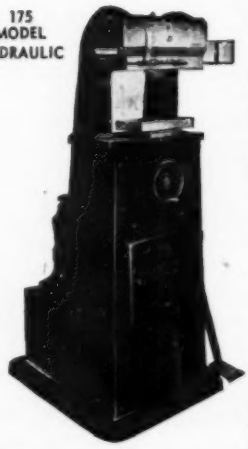

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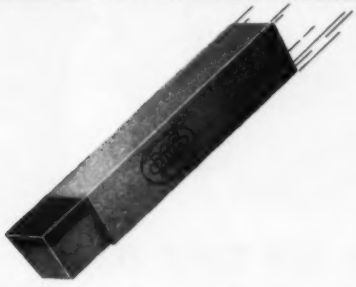

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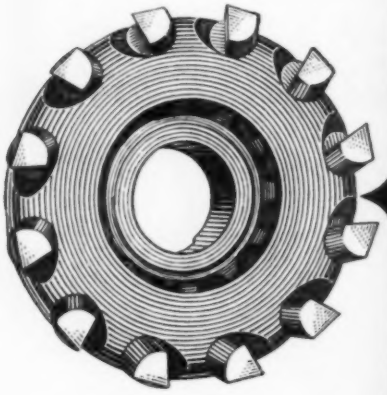

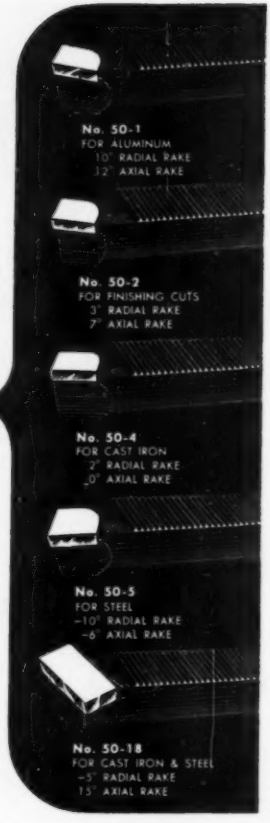

ANY OF THESE BLADES* WILL FIT ANY LOVEJOY STANDARD 4½"-24" DIA. TYPE "A" CUTTER EVER BUILT!

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- **What It Does**
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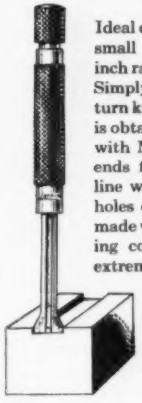

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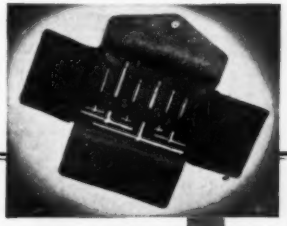

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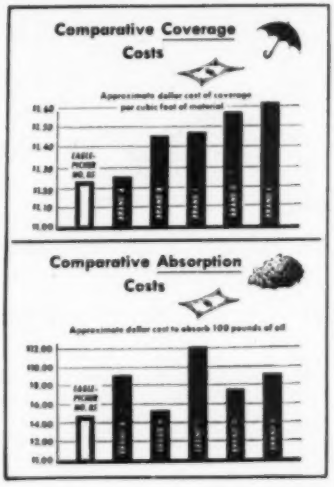
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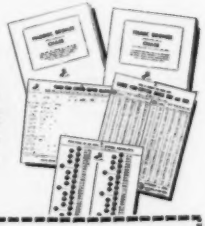

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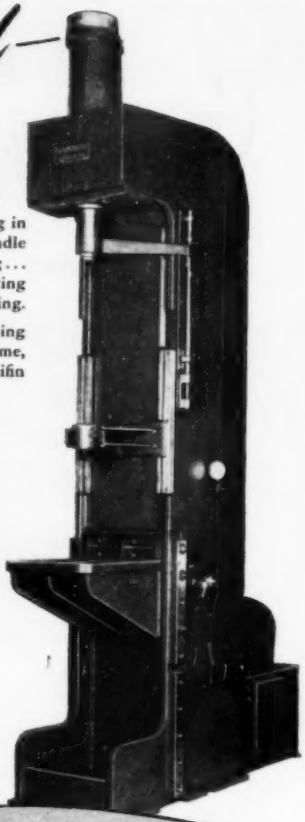
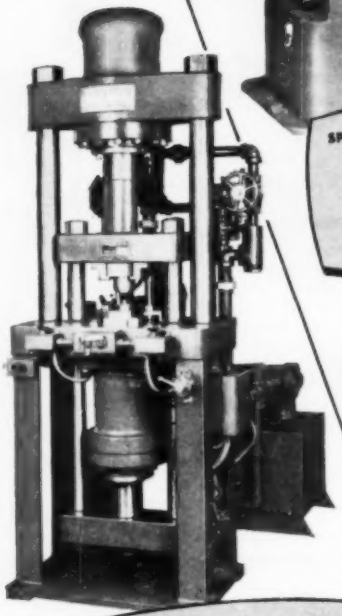
SPECIAL PRESS FOR TRACTOR PARTS—100-ton duplex press used for the assembly of track link pins for maker of crawler type tractors. Links are fed through and indexed. Left hand press ram advances, followed by right hand ram. Entire cycle is automatic.



SPECIAL PRESS FOR TESTING AIRPLANE STRUTS—20-ton open gap Hannifin hydraulic press with table adjustable for height. Reciprocation of ram is automatic up to a rate of 20 cycles per minute. Accommodates struts up to 136" in length for testing.



SPECIAL PRESS FOR ELECTRIC MOTOR COMMUTATORS—30-ton press with 20-ton clamp cylinder below table. The lower cylinder clamps the work and the upper cylinder follows down and performs riveting operation. Reverses automatically when riveting is accomplished.

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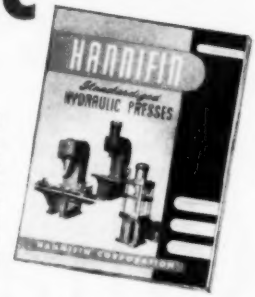

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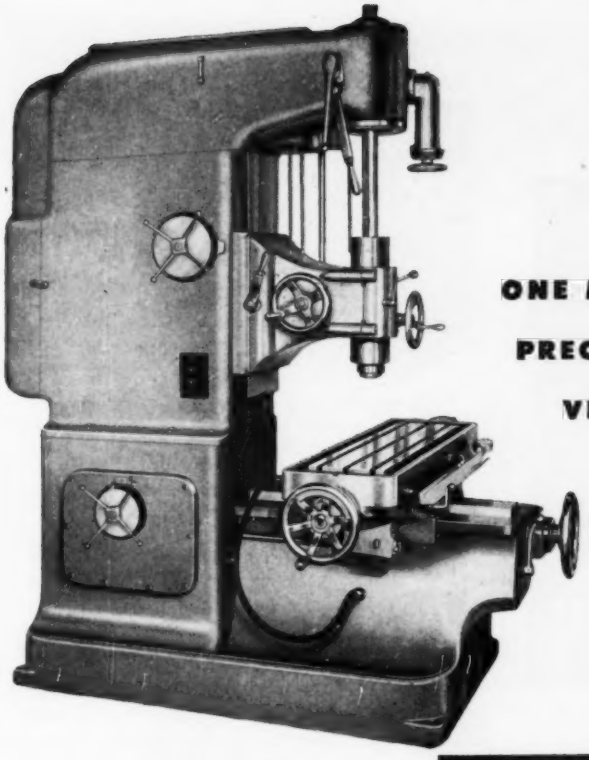

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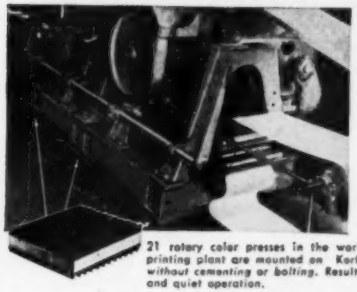

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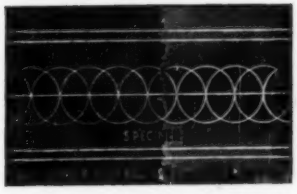

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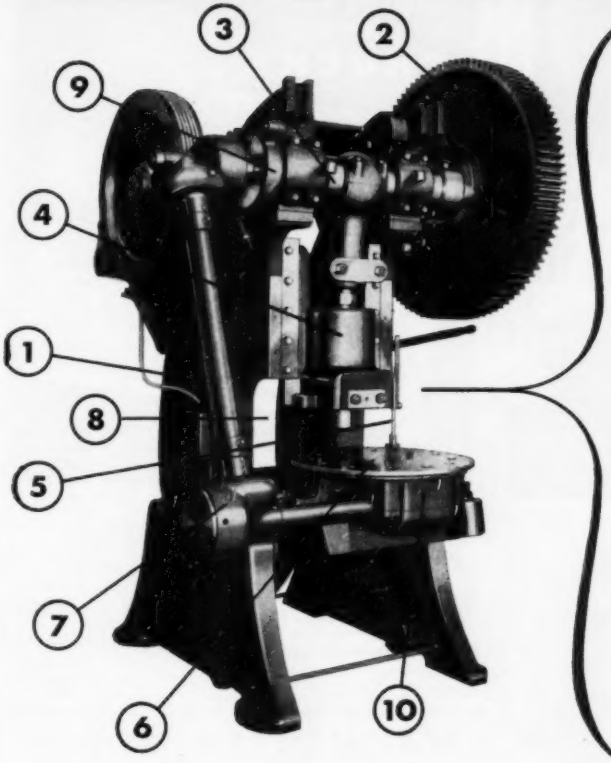

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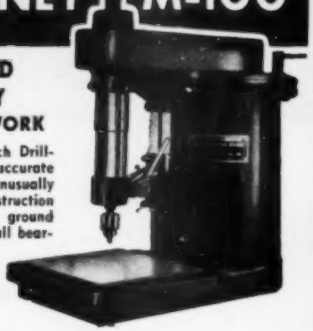

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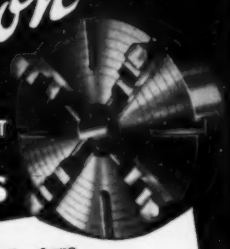

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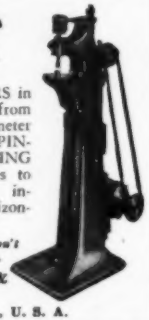

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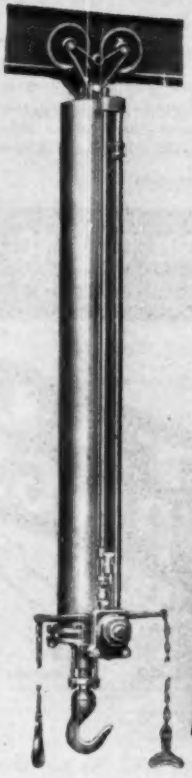

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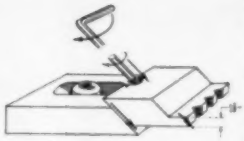

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Contents

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FORMING CHARACTERISTICS OF AUSTENITIC STAINLESS STEELS

PROCESSING AFTER FORMING

DESIGN, LAYOUT AND PREPARATION OF BLANKS

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THE FORMING OF CURVED SECTIONS AND TUBING

FORMING OF CONTOURED-FLANGED PARTS

DEEP DRAWING OF CUP-SHAPED, BOX-SHAPED AND RELATED PARTS

DOUBLE-ACTION DIE FORMING OF DEEP- AND SHALLOW-RECESSED PARTS

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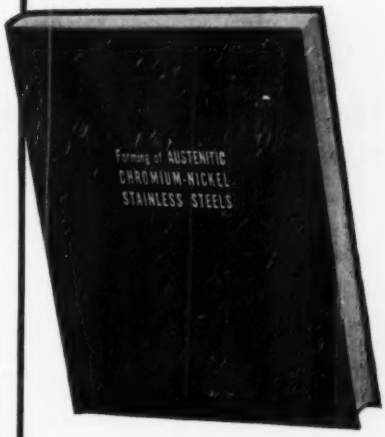

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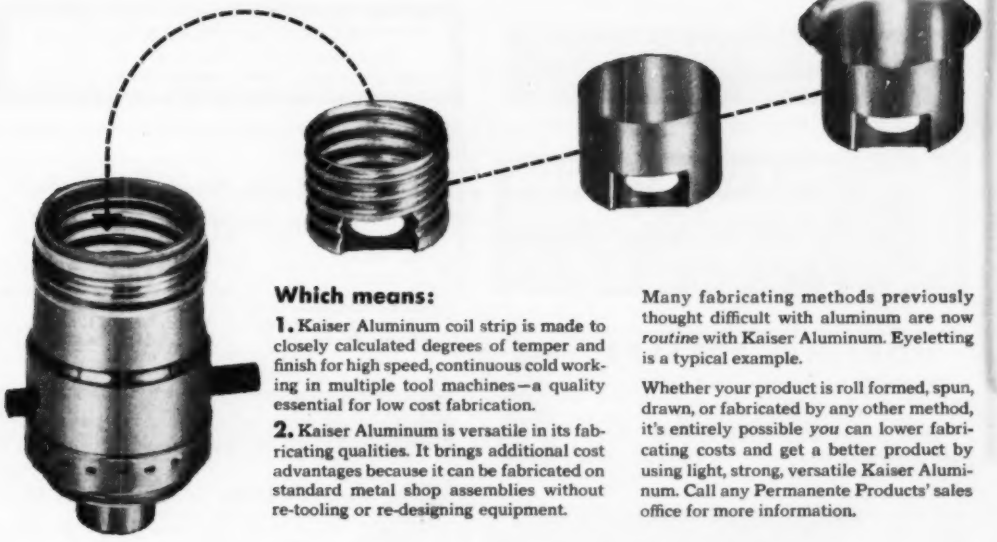

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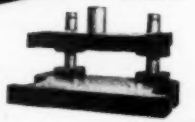

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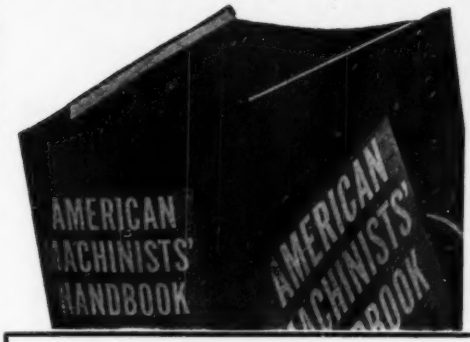

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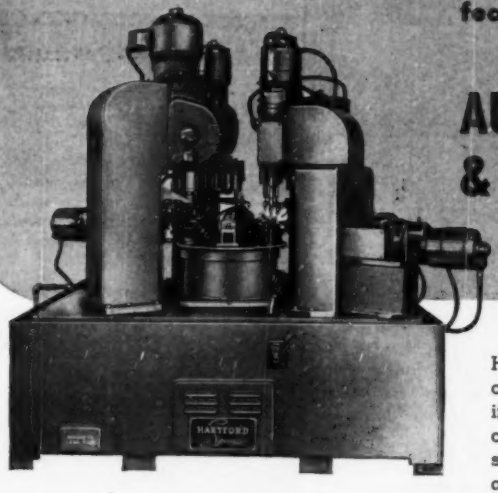

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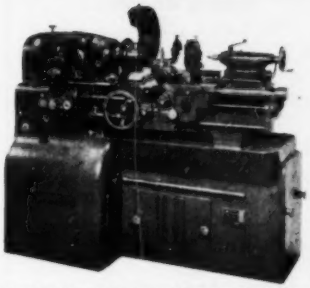


10"x20" Model #EE Monarch Precision Toolmakers Lathe. Late Type. W/Taper Attach. Collets, chucks, toolholders, tool cabinet. Immediate shipment.

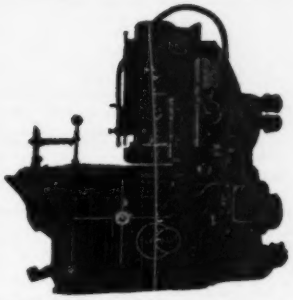
TURRET LATHES

Bardons & Oliver #1 Electric Turret Lathe. ¾" cap. Has bar feed & collets.
Morey #2 Geared Head 1" Cap., M. Dr.
Simmons Microspeed 1" Cap., M. Dr.
Oster #601 Hand Screw, Machine 1½" cap.
W-Swasey #4 Univ. 1½" cap., M. Dr.
Jones & Lamson #3 Univ. Bar Feed 1½"
W-Swasey #3 Univ. 1½" cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3½" cap., M. Dr.
Warner & Swasey #1A Universal Heavy Duty Saddle Type Turret Lathe. Serial #648220. Capacity—2½" rd., Grd. Hd. 12 speeds. Coolant system, bar feed, chuck & tooling. Immediate delivery. Excellent condition. Hydraulic Speed Selector.

Walsh O.B.I. Punch Presses, 6 tons to 38 tons capacity. Excellent condition. 220/440 volts, motors & controls. W/counters & blow-off Equipment. IMMEDIATE SHIPMENT FROM STOCK.

ENGINE LATHES

LeBlond 36"x30' Q.C.G. Hvy. Duty Geared Head Screw Cutting Engine Lathe. Serial #NK-230. 12 Speed Head. 36" internal grd. faceplate, Taper Attachment, Dial Thrdg. Set of toolholders. Max Swing—39". Centers—22'6". 25 h.p. 3/60/220/440 volts V-belt drive.
24"x16' American Q.C.G. Motorized Cone Head. 11' centers. Taper Attachment 24" chuck, faceplates, cabinet type legs. 220/440 volts motor
20"x10' American, Q.C.G. 72" centers.
20"x10' Hendey Motorized.
20"x8' Lodge & Shipley. Q.C.G. M. Dr.
18"x8' Davis Q.C.G. 42" centers, equipment.
18"x8' Lodge & Shipley, geared head.
18"x6' American, Geared Head, M.D.
18"x6' Monarch 8-Speed hd. Q.C.G. 220 volts motor. Actual swing—20¼". 20" c.c. Hex. Turret on crosslide. Cabinet legs.
16"x8' Hendey Q.C.G. M. Dr.
16"x6' Monarch 8-Speed Hd. Q.C.G. 220 volts motor. 24" c.c. Univ. Chuck, Draw-bar & set of 16th collets and 32nd collets.
16"x6' South Bend Enclosed Head, Motor driven. Taper Attachments, Chucks, Collets & Quick Acting Collet Chuck.



Blanchard #16 Motor Driven Vertical Rotary Surface Grinder. 26" Chuck with power down feed to head. Built-in coolant system.

14½"x6' South Bend Enclosed Head, Motor Driven. Taper Attachment, Chucks, Turret Toolpost Threading Dial, Ram Type Turret Attachment, Collets & Collet Chuck.
14"x8' Reed-Prentice Eight Speed Selective Geared Head, Q.C.G. Motor driven w/220/440 volts motor & controls. Has Taper Att. chuck, faceplates, steady rest, cabinet legs, max. centers —48" Completely rebuilt. Immediate shipment.

BETTS 100" Special Vertical Boring and Turning Mill. 1944 Machine. 2 Plain Heads. Complete electrical equipment. Excellent condition. Immediate delivery.

GRINDING MACHINES

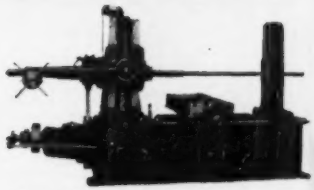
Cincinnati 10"x36" Plain Hydraulic Cylindrical Model #EA. Serial #5P2D1L-19. Filmatic Bearings. Built-in Electrics. Hydraulic Infeed.
Heald #22 & #25, 12" & 16" Horizontal Rotary Surface Grinders. Motor driven.
Cincinnati 'Monoset' Model #OE Cutter & Tool Grinder, Motor driven. With motors & controls. Set of collets, taper & cylindrical and equipment.
Thompson 6x18 Hydraulic Horiz. Surface. Wet & dry work. 220/440 motor driven. Auto, downfeed to head. Motor driven exhauster unit.
Gallmeyer & Livingston #4 Motor Driven Universal Tool & Cutter Grinder. W/Internal Attach. & Thrd. Chaser & Equipment. Motor driven coolant.
Norton 6x18 Vertical Rotary Automatic Surface Grinders. 220/440 volts motors. Excello Spindles. Hydraulic Table feeds. Three Available with immediate delivery. Also 6x18 Horizontal.

AUTOMATICS

#OG & #00 Brown & Sharpe Automatic.
#2G Brown & Sharpe Standard Speed. 220/440 volts motor & push button controls. Complete coolant, turret tooling, collet & collet chuck, toolblocks. FOUR AVAILABLE—FROM STOCK.
#2 Brown & Sharpe Automatic Turner drive 220/440 volts motor. With Stock stands, collet, toolposts, coolant system, change gears. FOUR AVAILABLE.
Cleveland Model "A" 3¼" capacity Single Spindle Motor Driven Automatic. Has lot of tooling, collets, motors and switches & coolant system. 1943.

PUNCH PRESSES

O.B.I. Johnson (NEW) all sizes, geared & plain.
O.B.I. Federal #3, 26 tons cap. motor dr.



Lucas #31, 3" Bar, Horiz. Boring Mill. #5 Morse taper. Motorized, 220/440 volts. All geared speeds and feeds.

O.B.I. Toledo #5, 44 tons cap. motor dr.
O.B.I. Bliss #18, 19C, 20, 20B, 21 motorized.
O.B.I. Michigan, 36 tons cap. Wide ram & bed.
Geared S.S.S.A. Bliss #305 Motor driven.
Wheel Press, Niles, B & Pond Horiz. Hydraulic. 200 tons cap. 48" between strain bars.
Stamping, Ferracute #86 Wide Frame, 61½" between housings. 13¾" stroke. Motor driven.
Transfer, Nilson 56 tons S.S. Dble. Crank 3-Die.
BLISS—Consolidated #77 Open Back Gap Frame Back Geared, 160 Tons Cap. M.D.

BORING MILLS

2½" bar Cleveland Horiz.
3½" bar Giddings & L O
5" bar Barrett #2 Cylinder.
8" bar Barrett #6 Cylinder.
Ryerson #11 Horiz. 3" Capacity.
24" Bullard Vertical, Motorized.
42" Bullard Vertical, Motorized.
54" Bullard Vertical, Motorized
42" Gisholt Vertical, Motorized.
60" Betts Vertical, Motorized.

MILLING MACHINES

Cincinnati #3, #4, #5 Pl. Horiz.
Brown & Sharpe #12 Production. 18" Autom.
Brown & Sharpe #12 Production. 24" Autom.
Brown & Sharpe #0, 1, 1Y Horizontal.
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mtg. Plain.
Milwaukee #2K Vertical, M. Dr. Dial Type.
Milwaukee #3K Vertical, M. Dr. Dial Type.
Milwaukee #1½ Dbl. Overarm, Horiz.
Milwaukee #2B Dbl. Overarm, Horiz.
Milwaukee #3B Plain Horizontal.
#3 Dial Type, H.S. Cincinnati Vertical Mill. Power Rapid traverse, speeds up to 1300 r.p.m. Range—34"x16"x16" Head has 6" vertical with four stop indicator. Serial #4A3V1L-61. Timken Bearing. 10 h.p. motor drive in base.

UNIVERSAL MILLING MACHINES

LeBlond #4 Hvy. Duty. 40x10x14 M. Dr.
Model #2L Cincinnati Universal. Serial #9A2U1J —102.15 speeds, 12 feeds. 220 volts motor in base.
Index #40H, 16"x8½"x16".
B & S #2, 20"x5"x17½".
B & S #1½, 20"x7"x18".
Bridgeport, 20"x9"x16" Turret Type.
Garvin #2MU, 24"x8"x18".
K & T "Milwaukee" #2, 28"x10"x17".
Kempsmith #2, 28"x8½"x18".
Cincinnati #2, 28"x10"x18".
Cincinnati #2M, 28"x10"x18".
B & S #3, 34"x10"x21".
Cincinnati #3S 34"x12"x20".
Some w/index heads & equipment.

RADIAL DRILLS

Cinci-Bickford 6' Arm, 15" Col. 24 Speeds.
Cinci-Bickford 5' Arm, 13" Col. 24 speeds.
Fosdick 5' Arm, 14" Col. Hvy. Duty, Motorized.
American 4' Arm, 11" Col. Motor on arm.
Cinci-Bickford 3' Arm, 9" Col. 12 Speeds.

EASTERN OFFERS FROM STOCK

ENGINE LATHES

10x20' centers Monarch EE Geared Head, m.d., latest
10x24' Logan, cone, motorized
12x30" centers American Geared Head, m.d., late
13x30" centers Pratt & Whitney Model B, m.d., taper
13x48" centers Pratt & Whitney Model B, m.d.
14x30" centers Lodge & Shipley Selec. Head, m.d., latest
14"x54" centers Lodge & Shipley, m.d., latest
14"x6' American Geared Head, m.d.
14"x6' bed Hendey Geared Head, m.d., taper
14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x8' Prentice, m.d., taper
14"x8' Pratt & Whitney, cone
14"x100" centers LeBlond, m.d. in leg, latest
15"x6' LeBlond Geared Head, m.d.
16"x30" Reed-Prentice, m.d., latest
16"x36" Pratt & Whitney Geared Head, m.d.
16"x58" centers Pratt & Whitney, cone, motorized
16"x6' Bradford, cone
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x6' bed Monarch Geared Head, m.d.
16"x10' Hendey Yoke Head, taper
16"x14' American Geared Head, m.d.
17"x8' LeBlond Geared Head, m.d.
18"x48" centers Lodge & Shipley, m.d., taper
18"x52" centers American Geared Head, m.d., taper
18"x5' LeBlond Geared Head, m.d.
18"x6' bed Lodge & Shipley, cone, motorized
18"x6' Monarch Geared Head, m.d.
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d.
18"x8' Champion, cone
18"x8' Hendey Geared Head, m.d.
18"x8' Lodge & Shipley Selec. Head, m.d.
18"x8' Lodge & Shipley, cone
18"x8' Whitcomb-Blaisdell, Geared Head
18"x10' Cincinnati, cone
18"x10' Lodge & Shipley Selec. Head, m.d.
19"x8' bed LeBlond Geared Head, m.d., taper
19"x10' LeBlond Geared Head, m.d.
20"x8' American Geared Head, m.d., taper
20"x8' Cleva, cone
20"x10' bed (60" centers) Monarch, Geared Head, m.d., taper
20"x10' Sidney Geared Head, m.d.
20"x11' Lehmann Geared Head, m.d., taper
20"x12' American Geared Head, m.d.
21"x12' Bradford, cone
21"x18' LeBlond, cone
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
22"x8' Lodge & Shipley, cone
23"x12' LeBlond Geared Head, m.d., taper
24"x10' Hendey Geared Head, m.d.
24"x10' American, cone
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Lodge & Shipley, cone
24"x12' Bridgeford Geared Head, m.d., taper
24"x12' LeBlond, cone
24"x12' Monarch Geared Head, m.d., taper
24"x40' bed American Geared Head, m.d.
25"x10' LeBlond, cone
26"x8' Bridgeford Geared Head, m.d.
26"x12' Bridgeford Geared Head, m.d., taper
30"x12'6" Niles-Bement-Pond, m.d., taper
30"x13'6" Niles-Bement-Pond, m.d.
36" raised to swing 42"x21'6" American Geared Head, m.d., taper, Timken
32"x12' Lehmann Hydrotrol Geared Head, m.d., taper, latest
36"x36'6" Niles Heavy Duty, m.d., latest, 2 carriages
50"x204" centers LeBlond Geared Head, m.d., taper, latest

MANUFACTURING TYPE MILLING MACHINES

No. 00 Sundstrand Hydraulic Rigidmill, m.d., latest
No. 0B Cincinnati Model EA, m.d., latest
No. 12 Brown & Sharpe, m.d.
No. 1-12 Cincinnati, m.d., latest
No. 1-18 Cincinnati, m.d., latest
No. 2 Sundstrand Electromill, m.d., latest
No. 2-18 Cincinnati, m.d., latest
No. 2-18 Cincinnati, m.d., with rise and fall, latest
No. 2-24 Cincinnati, m.d., latest
No. 2-24 Cincinnati, m.d., with rise and fall, latest
No. 4-48 Cincinnati Plain Hydromatic, m.d., latest
No. 4-48 Cincinnati Duplex Hydromatic, m.d., latest
No. 34-36 Cincinnati Duplex Hydromatic, with tracer control, latest
No. 34-36 Cincinnati Plain Hydromatic, m.d., with tracer control, latest
No. 50-72 Cincinnati Duplex Hydromatic, m.d., latest
No. 54-90 Cincinnati Duplex Hydromatic, m.d., latest
Type P Ohio Mfg., m.d.
Sundstrand Rigidmill, m.d.
4" Pratt & Whitney Splines, m.d.
No. 33 Kempsmith Mfg., s.p.d.
18", 24" Cincinnati Plain Automatic, m.d.
24", 48" Cincinnati Duplex Automatic, m.d.
30"x36"x12" Ingersoll Slab, 2 heads, m.d.
72"x6' Ingersoll Single Horizontal Spindle Traveling Housing Milling Machine, m.d.

SURFACE GRINDERS

No. 3 Abrasive, m.d.
No. 76 Van Norman Automatic Piston Turning and Grinding Machine, m.d.
Arter Model A-1-8" Rotary, m.d.
No. 11 Blanchard Rotary, m.d., latest
No. 16 Blanchard Rotary, m.d., 20" chuck
No. 22—12" Heald Rotary, m.d., latest
No. 22—12" Heald Rotary, m.d.
No. 23A—18" Heald Rotary, m.d., latest
No. 25A—24" Heald Rotary, m.d., latest
No. 33 Abrasive Vertical, m.d.
No. 260—10" Heald Rotary, belt
10x12x60" Norton Hydraulic Surface, m.d., latest
14" Pratt & Whitney Vertical, m.d.
22" Pratt & Whitney Vertical, m.d.
54" Bridgeport Knife, belt

TOOL & CUTTER GRINDERS

No. 2 Cincinnati Universal, m.d., latest
No. 2 Norton Universal Hydraulic, m.d., latest
No. 13 Brown & Sharpe, m.d., latest
Cincinnati Monoset, m.d.
Sterling Tool & Cutter, m.d.
Gleason Cutter, m.d.
No. 2B Sellers Drill, m.d.
No. 12M Grand Rapids Tap, m.d.
No. 4T Sellers Tool, m.d., latest
No. 5I Oliver Drill Pointer, m.d.

We carry an average stock of 2,000 machines in our 11 acre plant at Cincinnati. Let us quote on your requirements.

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio — MElrose 1241
CABLE ADDRESS **EMCO**

ALL PRICES DRASTICALLY REDUCED!!

All Late Type

Bullard Multaumatics, 16", 12", 8", late

#42 Lucas Boring Mill, 4" bar, '42 new

#28/60 Vertical Cincinnati Hydrotel, '44

2300 ton Bliss Hydraulic Press, sacrifice, late!

#2, #3 Cinci. Dial type, Univ. Mills

Acme Gridley Automatics & Chuckers up to 6½" cap.

#72 A5 Heald Sizematic, New 1945

5" Bar Table type boring Mill, Sellers, Late

#12 Brown & Sharpe Production Mills 48½"x12" table size, $2250.00 ea.

SPOT WELDERS & BRAKES

All sizes spot welders, air & foot operated. 25% off list price.

Hand Brakes all sizes up to 10'.

MONA MEMBER

PAULS MACHINERY COMPANY
6111 Vermont Ave. — Detroit 8, Mich.
Phone TYLER 7-6300

AUTOMATICS—Natl. Acme 1⅝", four spindle, Bargain (2)
BRAKE—(Press) Verson 10'x½" (1942)
HYDROMONER—Micromatic Model #4N (1943)
LATHE—Bamford-Chase Tool Room, 14"x6' Taper, Late
PLATE EDGE PLANER—H. & J. 32'x2"
MILLER—Plain K. & T. #4K, Late
PLANER—Cleveland Openside 60"x60"x20'. Late. Niles Bement Pond 46"x48"x26', 4 heads
PRESSES—Bliss #6, 125 ton, Late
Clearing—200 Ton (1943)
Bliss #310—440 Ton
(1) Lake Erie, 750 ton, Hydraulic. Bed 72"x146" single or dble. action. Late
ROLLS—Bending 30"x¾" Pyr., 10'x½" Pyr., 11'x ¾" Initial, 10'x¼" Pyr.

KINGS COUNTY
MACHINERY EXCHANGE
408 Atlantic Ave., Brooklyn 17, N. Y.
DEPT. "A"
Phone: TRiangle 5-5237

LATE TYPE MACHINES

Bullard 12" 6-spdl. MULT-AU-MATICS (2)
10"x48" Norton "C" Plain Grinder
#16-Y-28 Bryant Internal Grinder
#725 Fellows Gear Shaper
#3MS Cincinnati Plain Miller
#5H Kearney & Trecker Plain Miller
13"x30" Pratt & Whitney Model "B" Lathes

HAZARD BROWNELL
MACHINE TOOLS INC.
350 Waterman St., Providence, R. I.

No. 25T G. & L., 2½" table Hor. Mill, 1942
4" Univ. Table Mill, 60" vert., 96" hor., 1943
36" & 42" Xing Side Hd. Vert. Mills, '43
Nos. 1A & 3 W. & S. Turrets, bar & chuck
4'11" col. Bick. radial, '47; #282 Barnes drill
3' 11" Fosdick & 3' 9" Amer. Radials, '43
28/60 Cinci. Hydrotel Vert. Miller, 1 spin.
360° Cinci. 4 Spin. Profiler, 1942
Nos. 3 & 2MH Cinci. Pl. Dial Millers, late
Nos. 3E & 3H E. & T. Pl. Dial Millers, late
No. 3B Van Norman Pl. Miller, rsms, '43
No. 2G Kempsmith Univ. Miller, 1943 (3)
No. 2416 Keller Duplicator, late
Nos. 9J Gorton Duplicator & Vert. Miller (2)
Bridgeport Vert. Miller, slotting (3)
12"x24" G. & L. No. 45 Surface Grinder, '42
No. 70A Heald Internal Grinder, 1942
Gear Cutter, No. 13 B. & S., spur & bevel

BENNETT MACHINERY CO.
30 Church St., New York 7, N. Y.

1—National Acme Model TR-1 Thread Roller.
1—60" LaPointe-Hudson Broach Sharpener.
3—No. 000 B & S Production Mills.

D. E. DONY MACHINERY CO.
47 Laureiton Rd., Rochester 9, N. Y.

Bor. Mill, Hor. 4½" Bar N-B-P.
Bor. Mills, Vert., 24"-38"-42"-60"-72".
Drills, Radial, 3'-4'-5'-6' Cin.-Bick.
Grinder Surface, #2 Diamond, Mag. chuck.
Lathes, Turret, 3A W. & S., and 24" Gisholt.
Millers, Plain No. 3, 4, & 5-B Cincinnati.
Millers, Vert. No. 5 & 4 Cincinnati.
Shaper, Draw Cut, 36" Morton.
Sweeper, #3 Etna, 1½" tubing.

West Penn Machinery Company
1210 House Bldg. — Pittsburgh, Pa.

FOR SALE

INDUSTRIAL CHILLING MACHINE

DEEP FREEZE CASCADE 120° F. Height 38", Length 67", Width 32¼". Approximately 7½ cubic feet, WITH 2 MOTORS, ½ and ¾ HP. 3/60/220. PRICE $850.00

WINSTON MACHINERY CO., INC.
517 South Delaware St., Indianapolis 4, Ind.

FOR SALE

New Deep Freeze Cascade Industrial Double Unit. Each unit 7½ cubic feet. Low temperature, Minus 120 degrees F. complete. Price reasonable.

FS-9723, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

CHECK THIS LIST OF FINE TOOLS

AUTOMATICS

½"x2" No. 0G Brown & Sharpe automatic.
6" Bullard Multaumatic, 6 station, single index.
¾" National Acme Gridley Model R-6 6 spindle.
⅞" Cone 4 spindle.
1¼" Cone 4 spindle.
1⅛" Cleveland Model M, 4 spindle.
1⅜" No. 61 New Britain Gridley 6 spindle.
1⅜" Greenlee 6 spindle.
1⅞" Conomatic 8 spindle.
2"x18" Cleveland Model B.
2⅜" Acme Gridley Model RA6, 6 spindle.
No. 454 New Britain 4 spindle chucking.
14"x18" Monarch Mag-Na-Matic lathes.
14"x19" Fay, front and rear tool slides.
6" Sundstrand automatic stub lathe.
1" Economy type S automatic shaver, hopper feed.
No. 16 New Britain 6 spindle chucker with set of 9" two jaw chucks.

BROACHES

2 Ton American Model HO horizontal hydraulic.
No. 2-48 Cincinnati duplex vertical surface broach.
No. 1 Foote Burt double ram vertical surface.
No. 3 Type XA Oilgear hydraulic.
No. 3 Lapointe screw type.
American V48 vertical pull broach.
Model HAS 10-72 Colonial 10 ton 72".
10"x72" Colonial broach sharpener.

DRILLS UPRIGHT AND HEAVY DUTY

20", No. 2 Colburn single spindle box column
20" W. F. & J. Barnes box column.
20" Cincinnati Super-Service production.
20" Hammond type BA.
20" Sibley.
21" Camedy Otto New.
21" Cincinnati Bickford box column Mfg.
21" Barnes 4 spindle No. 210
22", No. 121 Baker box column heavy duty.
24" Cincinnati Bickford.
24" Cincinnati Bickford box column Mfg.
24" Kokomo.
24" No. 217 Baker 3 spindle, box column heavy duty.
24" No. 310 Baker heavy duty manufacturing.
24" No. 315 Baker box column heavy duty.
24" No. 25 Foote Burt heavy duty.
28" Aurora.
36" No. 513 Baker heavy pattern high speed.
No. 36 HO Baker hydraulic feed, 2 spindle, inverted type.

DRILLS, MULTIPLE

Baush horizontal two way multiple.
42 Spindle No. B16 Natco, 18"x48" drilling area.
34 Spindle No. 30 Natco, 22"x36" drilling area.
No. B4A Natco multiple drill or Holetapper.
22 Spindle No. 14 Natco, 16"x24" drilling area.
22 Spindle No. 15 Natco, 16"x24" drilling area.
18 Spindle No. 2 BL Natco hydraulic feed.
12 Spindle No. 39 Natco rail type.
No. 11 Natco 11" diameter round head.
12 Spindle No. 25 Baush hydraulic feed rail drill.

BORING MILLS, HORIZONTAL AND VERTICAL

2½" No. 25T Giddings & Lewis.
3" No. 3A Universal.
3¾" No. 32 Lucas table type.
3¾" No. 5A Defiance table type.
5" bar Jones planer table type.
100" Niles Bement Pond. Extra Heavy Pattern vertical.
52" King vertical.

SHAPERS

28" Gould & Eberhardt, "Invincible" type.
24" Gould & Eberhardt.
24" Columbia Heavy Duty with universal rotatable table.
20" & 24" Gemco universal. NEW.
20" Gould & Eberhardt.
20" Gould & Eberhardt high duty.
Two 6" Pratt & Whitney vertical.

THREADERS

No. 11 Murchey ¼" to 1½" long bed pipe or bolt.
2" Landis pipe threader.
1" Hill Acme.

MILES MACHINERY CO.
SAGINAW, MICH.

A FEW MACHINES FROM OUR LARGE STOCK

AUTOMATICS

Brown & Sharpe #00G, H.S., #4, #6
Conomatic 8 sp. 1⅞" cap.
New Britain Gridley 61—8 Sp. 2¼"

BORING MILLS

Giddings & Lewis #8, #25T, Bullard, 42" V.T.L.
Universal 3" horiz., Lucas #31 horiz.

DRILLS AND RADIALS

Amer. 4'-13" col. Radial, Canedy-Otto 3'-8" col.
Carlton 5'-19" col., Foote-Burt 6 Sp.
Cincl-Bickford Super-Service 21", 24"
Natco Model E-5 Multi-Spindle, 14 spindles
Sibley 24"-28", Allen 6 Sp., Excelsior 21"

ENGRAVERS

Gorton #3U, 3Z, 3L; Deckel G1, G1F
Gorton Cutter Grinders 375-2, 265-5

GEAR EQUIPMENT

Fellows #72, 725 High Speed, Mikron Gear Hobber
Michigan, Gleason, Fellows Checkers
Gleason #2 Surface Hardness

GRINDERS—Miscellaneous

Brown & Sharpe #5 cyl., 3"x18", Black Diamond
Brown & Sharpe #1, #3 Univ., #13 Univ. & Tool
Cincinnati #2 Centerless Filmatic
Cincinnati Universal Filmatic, 12"x36", 12x48"
Covel #51A Univ. Tool & Cutter
Gardner #220, 36" disc. Heald #1 Tool
K. O. Lee Tool & Cutter, Hammond #4 Carbide
Landis #4H Cyl. 4x12", #6 Thread, Landis Centerless
Norton #2 Tool & Cutter, Porter Cable Belt WGR
Norton Cyl. 6x18" Type C, 6x36" Type C
Oliver #510 Drill Pointer, Sellers #4G
Pratt & Whitney Radius #R6, Grenby Int.

GRINDERS—Surface

Abrasive #1½" Wet, #34 Vertical, #33
Atlantic 6x18" Power Feed, Foote-Burt Hammond
Blanchard #18—42" Chuck
Brown & Sharpe #2
G. & L. #18, 6x18" Hand Feed, #25, #35 Hyd.
Hanchett #300, 13x48", Mattison 14x16x48 Hyd.
Norton 6x18" Hyd., Pratt & Whitney 12x36" Vert.
Reid #2A P.F., #2C Pope & Excello Spdl.
Thompson Hyd. 6x10x18", 6x12x18

LATHES

Bradford 16"x6', Hardinge Precision 9", cabinet
Hendey G. H. 16x30 with relieving att.
LeBlond Regal 16"x31½", 15x30", 19x48", 21x60"
Ladue & Shipley 16x78" T.A., LeBlond HD 16x33"
Monarch 18"x20" EE, 16x78" T.A., 12x30" CKK
Rivett Precision, Logan 10"x30"
South Bend 9"x3', 9"x5½", 13x36", 10" Cabinet
Sebastian 12"x4', G.H., Sheldon 11x24, 1" collet

Lathes—Turret

Acme #6W Bar and Chuck, 6W Fox Lathe
Bardons & Oliver #3, #5, Foster #3B
Brown & Sharpe #1, #2F Hand Screw Mach.
Gisholt #4, 5 Bar & Chuck 2L
Jones & Lamson #8A Univ., Hardinge ESM
Oster #501 Rapiduction, Murcy #3, 1½" cap.
Warner & Swasey #3, #4, #4A—8" Bar Cap.

MILLS—Plain & Universal

Brown & Sharpe #2B Pl., #2A Univ.
Cincinnati #3 Plain, 2MH Univ.
Milwaukee #2HL, 2K, Plain, #2HL, 2H, Univ.
Van Norman #12, 2B, 22L, 3B

MILLS—Vertical—JIG BORERS

Brown & Sharpe #2, Index, Vernon, Bridgeport
Cincinnati #4, Jackson
Gorton #8D, 9J Plain, #8½D Duplicator
Kearney & Trecker #5H, 3H High Speed
P&W 1½B Jig Borer, Sip Jig Borer #MP-5
Moore Jig Grinder, Vernon jig borer
Murcy #12M Profiler 2 sp.—Pratt & Whitney 12B

MILLS—Production

Brown & Sharpe #000, 12, 21
Cincinnati #1-12, 1-18, 2-18 Mfg.
Nichols Hand, U.S. MM 1, Kent Owens #1V
Sundstrand #00 Rigidmills, U. S. Duplex

PRESSES

Bliss #8 Dbl. Crank, Bed 42x100", 250 Ton
Bliss #675, 645B, 650 Hi-Production, 304A, 305A
Bliss #20, 21 O.B.I., #4½ Double Action Cam
Bliss #56 OB, Gap Frame #62, 62A, 102
Henry & Wright 25, 75 Ton Dieing
Reliance 45 ton O.B.I.
Thomas 7A, 80 Ton O.B.I., Gen. Flex Elec. Screw
V. & O. #25S O.B.I., #102 Reducing, #6 O.B.I.
Zeh and Hahnemann 30 tons

MISCELLANEOUS

BAND SAW: DoAll #ML, DoAll Metalmaster, Tannewitz #36M
BENDING ROLL: Buffalo #8, Excelsior #14
BROACH: 3L LaPointe Horiz. Hydr.
HACKSAW: Marvel #6A Automatic, #6 #4B
HONER: Micromatic #H-1 Hydrohoner, Sunnen
IRONWORKER: Buffalo 25U x 20 Univ.
KEYSEATER: Mitts & Merrill, Baker, Davis, Burr
PRESS BRAKE: #253, #335 Chicago
RIVET HAMMERS: Hi Speed, all sizes, Chic. Pneu.
ROUTER: Onsrud #W240, #55 Oliver
TAPPERS: Bakewell #1, Haskins #2C, 3C
THREAD ROLLER: Waterbury-Farrel #30 with Dies
WELDERS SPOT & SEAM: Sciaky, Taylor Winfield
WRAPPING ROLL: Buffalo #½

HYDRAULIC EQUIPMENT

Cap.	Manufacturer	Platen Stroke	Opening
500 Ton	Lake Erie	35x38"	56" 68"
600	Beld. S'thw'k	70x59"	22" 30"
500 D.A.	H.P.M.	36x30"	24" 30"
1000	French Oil	53x42"	20" 50"
300	Brand New Watson Stillman Hobbing Press		
375 D.A.	Elmes	84x44"	12" 42"
350	Verson	48x48	36" 72"
50	Dennison	22x20	18 23
150	Southwark	34x30	30 2" to 4'

UP MOVING RAM PRESSES

50 & 100 Ton Stokes Molding Presses & Pumps
300 Ton Dunning & Boschert Molding Press
500, 800 Ton Waterbury-Farrel 3 & 4 Rod Presses
300 Ton Watson Stillman Press, 24x20" Platens
400 & 500 Ton Shaft Straighteners—Self Contained

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MACHINE TOOLS

BORING MILLS—Horizontal
CINCINNATI GILBERT 3½" bar, floor type, latest
GIDDINGS & LEWIS #45, 5" Bar Table Type, latest
LUCAS #41, 5" bar, Table Type, "Precision", Latest
NILES-BEMENT-POND 5", 8" bar, Floor type, M.D.
UNIVERSAL 3" bar, high speed, latest type

BORING MILLS—Vertical
BETTS 120", 2 swivel heads, AC, Motor Drive
BULLARD 6" 8 Spin. Mult-Au-Matic, Type J, latest
BULLARD 12" 6 Spin. Mult-Au-Matic, Type D, latest
BULLARD 16" 6 Spin. Mult-Au-Matic Type D, latest
BULLARD 24", 36", 42" "Spin-Line Drive," Latest Type
COLBURN 72", 2 Swivel Heads, PBT, Motor Drive
NILES 100" 2 swivel heads, PBT, D.C., Motor Dr.

DRILLS—Miscellaneous
AMERICAN 4' arm 11" col., "Hole Wizard", Latest
CINCINNATI BICKFORD 24" Box Col., Latest
LELAND & GIFFORD #2 LMS 6 spindle, Latest
NATCO 4 AL 30 spindle, Multiple, Latest Type
PRATT & WHITNEY 1¾x50" Deep Hole, Latest

GEAR CUTTING EQUIPMENT
FELLOWS #01, #7, #7A, #12, #15, #17, #2, #61A, #62S, High Speed Gear Shapers, latest type
GLEASON 3", 12" straight bevel generator, Latest
GOULD & EBERHARDT 12H, 12HR Hobber, Latest
GOULD & EBERHARDT 06H, Hobber, with diff., m.d.
SYKES #1½, 18" Cap., Herringbone Gear, M.D.

GRINDERS—Cyl.—Plain & Univ.
BROWN & SHARPE #13 Univ. Cutter & Tool, Latest
BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
LANDIS 4x12, Type H Plain Hyd., Latest Type
NORTON 6x18", 10x72", 14x36", Type C, Plain, latest
VORTON 6"x36", 10"x36", type C, Pl. Hyd., latest

GRINDERS—Miscellaneous
BARBER COLMAN #3, 4, hob sharpener, latest type
BRYANT #16-CP-16, #24 Int. Hyd., latest type
CINCINNATI #2 Centerless "Filmatic," latest type
HEALD 72A3, 72A5 "Gagematic," Internal, Latest
HEALD 75A, 72A3, 72A5, 74, 76A Internal, latest
LANDIS #12 Centerless, Hydraulic, Latest Type

GRINDERS—Surface
BLANCHARD #11, 16" chuck, Latest Type
HANCHETT Series 300, 12"x48" Vert. Sp. Hy. Latest
HEALD 25A—Rotary—16" and 36" chuck, hyd., latest
THOMPSON 12x12x24 Type B Hyd., Latest Type

LATHES—Engine & Mfg.
AMERICAN 36"x360" centers, 2 carriages, motor dr.
LEHMANN 16x30" centers, TIMKEN, latest type
MEDART #6L8F Bar Turner, 1" to 6" Cap. Latest
MONARCH 10"x20" centers, Model EE Timken, latest
MONARCH 12"x30" Centers, 12"x54" Centers, Model CK, Timken Bearing, Latest Type
MONARCH 22"x456" centers, 2 carriage, Timken Bearing, Model CM, motor drive
NILES 30x50" Boring, "Dimensaver" Timken, Latest
PRATT & WHITNEY 14"x54" Centers, 10"x30" Centers, Model C, Timken Bearing, Latest Type
SPRINGFIELD 16"x30" centers, Timken, latest type

LATHES—Turret
BARDONS & OLIVER #3, #7, Timken, Latest Type
FOSTER #4FU "Fastermatic" Timken, Latest Type
GISHOLT #1L, #2L, #3L, Universal, Timken, Latest
GISHOLT #2, #4, Univ. TIMKEN, Latest Type
JONES & LAMSON #2, #5 Univ., Timken, Latest
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest
WARNER & SWASEY #2, 3, Ram—Timken, latest
WARNER & SWASEY #2A Universal, Latest Type
WARNER & SWASEY 4A Universal, Timken, Bar and Chucking, (New 1947)

MILLING MACHINES—Plain
BROWN & SHARPE 2B, 3B, Timken, Latest Type
CINCINNATI 00 Auto., rise and fall, latest type
CINCINNATI 6-36, 2-15 Hydromatic, Simplex, latest
KEARNEY & TRECKER 1218, 1404, Latest type
KEARNEY & TRECKER 3H, 3HI, 4H, Timken, latest

MILLING MACHINES—Thread
LEES BRADNER 12"x54", Model HT, Latest Type
MOREY 12"x30" and 60" centers, Latest Type
PRATT & WHITNEY 6x60", Model C, Latest Type

MILLING MACHINES—Universal
BROWN & SHARPE 2A, 3A, Timken, Latest Type
KEARNEY & TRECKER 2H, 3H, Timken, Latest
VAN NORMAN #12, #26, #36, Timken, latest

MILLING MACHINES—Vertical
BROWN & SHARPE #2B Timken, High Speed
CINCINNATI #2, Dial Type, Timken, latest type
GORTON #3½D, 9J, high speed, latest type
KEARNEY & TRECKER #3H, Timken, latest type

PLANERS
BETTS (CONSOLIDATED) 84"x92"x16', 4 heads, Rapid Traverse, D.C. M.D.
NILES "Time Saver" 42"x42"x14', 3 heads, Rapid Traverse, A.C. vari-voltage drive, Latest
NILES "Time Saver" 48"x48"x12', 2 heads, Rapid Traverse, D.C. reversing motor drive

SCREW MACHINES—Automatic
CONOMATIC 2⅝"—6 spindle, High Speed, Latest
GOSS & DeLEEUW 8" auto. Chucker, 5 spin., Latest
GOSS & DeLEEUW 6"x6¾" Auto. Chucker, Latest

MISCELLANEOUS
BARNES #172, 306H, 307, 307B Vertical Hone, Hydraulic, Self-Oiling, Latest Type
CINCINNATI 1-30, 3-30, Duplex Vert. Surface Broach, Double ram, Model FR, Hyd., Latest Type
HENRY & WRIGHT 50 ton Dieing Press, M.D.
KEARNEY & TRECKER Model B Autometric Jig Borer, Latest Type
LEWIS ⅝"x20' Pyramid Type Bending Roll, M.D.
MICHIGAN 1712 Universal Reliever, Latest Type
PRATT & WHITNEY (KELLER) Type BL-2416 & Type G Copying, latest type, 2 & 3 Dimensional

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UNIVERSAL & THREAD GRINDERS
Brown & Sharpe #1, 18" x 20"; #2, 14" x 30" and #3, 14" x 40" Univ. with attchmts. (late type)
Cinn. 14" x 72" Univ. Film. Brg. attchmts. 1942
Excello #35 Univ. Thread Grinder—8" max. dia. — 22" max. length — excellent cond. 1942

SURFACE GRINDERS
Mattison 24" x 18" x 96" and 12" x 16" x 48" Hydraulic Hi-Power Precision — coolant — chucks
Gallmeyer and Norton 6" x18" Hydraulic Horizontal with coolant and chucks
Blanchard #11 Rotary Surface—16" chuck (late)

VERTICAL MILLERS
Milw. (K & T) #3K Hi-Speed — wkg. tbl. 64" x 15½"—15 to 1500 RPM range—34" x 14" x 16" (late)
Milw. (K & T) #2K Hi-Speed—wkg. tbl. 56" x 12"—30 to 1500 RPM range—28" x 12" x 14"—(late)
Reed-Prentice #4 Improved Hydraulic Vertical —wkg. tbl. 70" x 24"—18 speeds 30 to 1200 RPM—Power Feed to head—1945

TURRET LATHES (late type)
Bardons & Oliver #3, 12-speed Ram type Univ. —100 to 1345 RPM—1⅞" hole—16" turning length—13¾" swing over ways—bar equip. and tooling.
Gisholt #4 Presetec, rld.—12-speed Ram Type Univ.—46 to 730 RPM—2-42/32" hole—44" turning length—17¾" swing over ways—chucking with tooling.
Jones & Lamson #3 Univ. Ram Type—14-speed —40 to 1000 RPM—2½" bar cap.—14" turning length—21¼" swing—bar & chucking—tooling.
Warner & Swasey #3, 12-speed Gr. rld. Univ. Ram type—127a swing—1½" bar cap.—67 to 740 RPM—bar & chucking—tooling

BORING MILLS
Defiance #25A — 3¼" bar — (late) — added vert. & cross range—speed 12 to 1000 RPM —face plate to outer support top rail, to centerline spdl. 48"—cross travel tbl. 72"—taper #6 Morse.
Universal 4" bar "Triway"—face plate to outer support 72"—top tbl. to centerline spdl. 48"—#6 Morse taper—added vert. range.
Niles-Bement-Pond 62" Vert.—standard pattern—2 hds. on cross rail—motor driven.

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#4-R GISHOLT SADDLE TYPE TURRET LATHE, SERIAL NO. 2914-37, 9" HOLE IN SPINDLE, Mfg. approx. 1942.
PRICE $4,500.00

#3-R GISHOLT SADDLE TYPE TURRET LATHE, 5" HOLE IN SPINDLE, 1942 MACHINE.
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Both Machines in Excellent Condition

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LATE TYPE MACHINE TOOLS

AUTOMATICS
6" RPA-8 Acme-Gridley Chucker. 1941.
16" Bullard Mult-Au-Matic, 6 spdl. '41.
1⅝" Greenlee, 6 spindle. 1942.
⅞" RA-6 Acme-Gridley. 1942.
No. 60 New Britain, 1" cap. 1943.

BORING MACHINES
No. 42 Lucas Horizontal. 1940.
No. 54 Excello Double End. 1940.
No. 46B Heald Single End. 1940.

DRILLS
3'9" Cincinnati-Bickford Radial. 1946.
25" Fosdick "Economax". 1941.
W-6 Baush Hyd. Mult. Spdl. 1943.
No. 40 Fox Multiple Spdl. 1944.

GEAR EQUIPMENT
3" & 12" Gleason Generators. 1941.
No. 6 & 17 Gleason Testers. 1943.
12" Red Ring Internal Shaver. Late.
No. GCL-3 Red Ring Shaver. 1942.
No. 624A3 Fellows Side Trimmer. New.
No. 615A & 61A Fellows Shapers. 1943.
No. 7125A & 712 Fellows Shaper. 1943.
Vinco Spline & Gear Grinder. 1942.

GRINDERS, CYLINDRICAL
16"x36" Cincinnati Plain. 1942.
12"x48" Cincinnati Univ. 1943.
10"x72" Landis Plain. 1942.
10"x18" Norton Plain. 1942.

GRINDERS, INTERNAL
No. 74 Heald Ext. Bridge. 1941.
No. 72A3 & A5 Heald Plain. 1944.
No. 5 & 16A22 Bryant. Latest.

GRINDERS, SURFACE
14"x36" P&W Vertical. 1938.
No. 22 & 25A Heald Rotary. 1943.
No. 2—1 Reid, 6"x18" cap. 1940.

LATHES, ENGINE
45"x192" Axelson. 1942.
28"x276" Bertram. 1942.
24"x168" Sidney. 1942.
18"x54" Lodge & Shipley. 1943.
18"x48" Bradford. 1942.

LATHES, PRODUCTION
Gisholt "Simplimatic". 1943.
No. 3A L&S "Dumatic". 1943.
No. 2FU Foster "Fastermatic". 1943.
20"x97¾" LeBlond Rapid Prod. 1941.
8"x108" Lo-Swing Semi. Auto. 1942.
Model 8, 10 & 12 Sundstrand. 1942.
14"x42" Monarch "Magna-Matic". 1941.

LATHES, TURRET
36" Bullard Vertical. 1943.
No. 2A & 3A Warner & Swasey. 1943.
No. 1 & 8½"x24" Acme Univ. 1943.
No. 3L Gisholt. 1941.
No. 2, 3, 4 & 5 Warner & Swasey. 1943.
No. 2, 3, 5 & 7 Bardons & Oliver. 1942.

MILLS, PLAIN
No. 5 Cincinnati. 1943.
No. 4H & 4K Milwaukee. 1943.
No. 3 Van Norman. 1942.
No. 2HL Milwaukee. 1942.

MILLS, PRODUCTION
BL-2420 P&W "Keller". 3 sp. 1942.
BL-2416 P&W "Keller". 1 sp. 1943.
BG-1 Keller, single spdl.
No. 1848 Kearney & Trecker. 1942.
No. 1248 Kearney & Trecker. 1942.
No. 1-18 & 2-18 Cincinnati. 1942.

MILLS, THREAD
6"x60" Pratt & Whitney. Latest.
12"x54" Lees Bradner. 1943.
8"x16" Hanson Whitney. Late.

MILLS, UNIVERSAL
No. 2MH Cincinnati. 1942.
No. 2H Milwaukee. 1942.
No. 2SU & 26SU Van Norman. 1942.

MILLS, VERTICAL
No. 3B P&W Univ. Die Sinker. 1943.
No. 3H & 3K Milwaukee. 1942.
No. 2 & 3 Cincinnati. 1941.
No. 2K Milwaukee. 1942.

PRESSES
No. 40-54 Minster. 1946.
100 Ton Hannifin, Hyd. 1942.
45 Ton Reliance. 1942.

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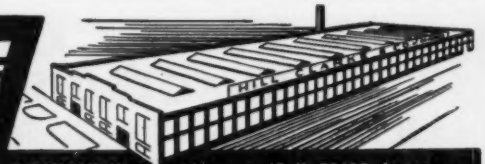
HILL-CLARKE MACHINERY COMPANY



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AUTOMATICS

1⅝" Greenlee, 6 Spdls. (1941)
No. 61 New Britain 6 Spdls. 1⅛" (1942)
No. 6 Brown & Sharpe, M.D.
No. 49 New Britain, 4 Spdl. Chucker
Model A 2½" Cleveland (1943)
Model A 3¾" Cleveland (1942)

DRILLS

No. 130 Baker, tapping (1942)
No. D8 Colburn, No. 6 Morse Taper
No. 2 Fosdick 4 Spdl. (1942)
No. 2 Fosdick 6 Spdl. (1942)
No. 1-LMS Leland-Giffords (1942)
No. 2-LMS Leland-Giffords (1942)
No. 4BL Natco 36 Spdl. (1943)
5' Western Heavy (1942)
6'-17" Col. Fosdick Economax Radial

GEAR MACHINES

No. 61-A Fellows Gear Shaper (1942)
No. 71-A Fellows Gear Shaper (1942)
No. 7125 Fellows (1943)
No. 72 Fellows Gear Shaper
No. 18H Gould & Eberhardt
72" Cincinnati Gear Cutter

BORING MACHINES

No. 31 Lucas, 3" bar, M.D.
No. 4B-B Heald Bore-Matic (1942)
No. 112—C Excello 2 Spdl. (1942)
42" Colburn M.D.
60" Colburn, M.D.
72" Niles Extra Heavy
84" Betts, M.D.

GRINDERS

3"x12" Brown & Sharpe No. 5 (1944)
4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
Norton Motorized Grinders ranging from 6"x18" to 24"x240"
No. 5—8"x24" Covel Hydr. Surf. (1941)
No. 36-A Hanchett Rotary Surface (1942)
72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinders (1942)
74 Heald Internal Gdr. (1942)
Bryant Internal Grinders (1942)

LATHES

14"x30" centers Pratt & Whitney, Model C
14"x30" centers Monarch
16"x54" centers LeBlond (1941)
16"x60" centers Pratt & Whitney, Model B
18"x8' American, Grd. Heald, M.D.
19"x38" gap x 10' LeBlond
36"—48"x16' Lehman Hydratrol (1945)
8"x15" Sundstrand, Model D (1943)
10" Sundstrands (1942, 1943)
16" & 20" Fay Automatics (1942)
No. 2 Warner & Swasey, Bar Feed (1942)
No. 4 Gisholt Univ. Turret Lathe (1942)
No. 4R Libby, Bar Feed (1942)
No. H-5 Libby
No. 5 Bardons & Oliver (1942)
No. 5 Midland, Bar Feed (1942)
No. 2-A Warner & Swasey
No. 1-H Libby, 6¼" Hole in Spindle (1937)
No. 1-H Libby, Extra Long Bed (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

MILLING MACHINES

No. 2 SP Van Norman Plain (1942)
No. 2 H Milwaukee Vertical (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-18 Cin. Mfg. (1940)
No. 2—18 Cincinnati, Rise & Fall (1941)
No. 2—18" Sundstrand-Electromil (1942)
38"x40"x10' Fitchburg Duplex Miller (1943)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 34-48 Cincinnati Hyd. Duplex
No. 45-48 Cinn. Hyd. Duplex
No. 56-72 Cincinnati Hydromatic
4½"x12" Pratt & Whitney, Model C
8"x36" Lees-Bradner—Model HT (1943)
10"x48" Hanson-Whitney Thread (1942)
24"x24"x12' Ingersoll Adj. Rail
36"x36"x16' Ingersoll Slab Miller, 4 Hds.
No. 10 Ingersoll 72"x8' Travelling Col. Face Millers (1942)

MISCELLANEOUS

18" Dill Slotter
Micromatic Vertical & Horizontal Hydrohoners
25" Smith & Mills Shaper, M.D.

PLANERS

36"x36"x12' Cincinnati
36"x36"x18' Gray, Maxi Service, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

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Metal Forming and Bonding Machine
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Roller Type Slab Miller 22" Slab capacity
12 Spindle Moline Automatic Drilling Machine
3 Spindle Moline Model 7-D Cylinder Borer
1-A W&S Universal Turret Lathe
36" x 14' Schumacher & Boye Engine Lathe
Libby 26" x 4½" Spindle Turret Lathe
29" Stockbridge Shaper
Lees-Bradner CT 36" Thread Millers
Crankshaft Grinder
Foote-Burt 5 Spindle Drill #2 M.T.
Acme Griddly 4 Sp—Model 6—1¾" Auto.

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CHUCKER, P & J Model #5D
DRILL, Natco B4B, 48 Spindles
GEAR MACHINE, Cross #50
GRINDER, Landis #4H, 4" x 18"
GRINDER, Hanchett #36, 40" Chuck
GRINDER, Blanchard #18, 36" Chuck
GRINDER, Cincinnati #3 Centerless
HONES, Sunnen Models LB and MA
LATHE, LeBlond 20" x 20' Centers
LATHES, Gisholt #3 Turret
LATHES, W&S #4 Barfeed & Chucking
LATHE, Bullard 36" Vert. Turret
LATHE, Hardinge #59 2nd Operation
LATHES, Gisholt #12 Automatic
MILLERS, K & T 1224 Simplex Prod.
MILLERS, Hall Planetary Type C
SCREW MACHINE, Cone 1⅞" 8-Sp.
SCREW MACHINES, 1" RA-6 and RA-4

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57-B Edison Pl.
Newark 2, N. J.

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No. 19 Bliss O. B. I. Punch Press. Has roll feed.

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One 10 ft. Wellman Galusha and one 8 ft. Dover Galusha Gas Producers. First class condition. Ideal for independent gas suppply.

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FOR SALE

110-Ton Cleveland 11S 9" stroke 1946—Air Cushion—w/m
400-Ton Cleveland Knuckle Joint Press 4" stroke w/m—A1 condition now under power.

Seaboard Steel Co., Inc.
New Haven, Connecticut

EXCEPTIONAL BUYS - CLEAN TOOLS

1—#3 BARDONS & OLIVER Universal Turret Lathe, late type, bar and chucking.
1—#SLO 18 x 24 SURFACE COMBUSTION Die Hardening furnace. (Cheap)
1—Only 183" HONES Die Hardening Furnace. (Cheap)
1—#4 CINCINNATI Universal Horizontal Milling Machine, motorized.
1—VERNON Jig Borer, late type.
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1—MAGNAFLUX Tester. (Cheap)
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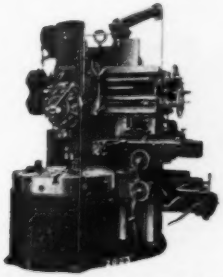

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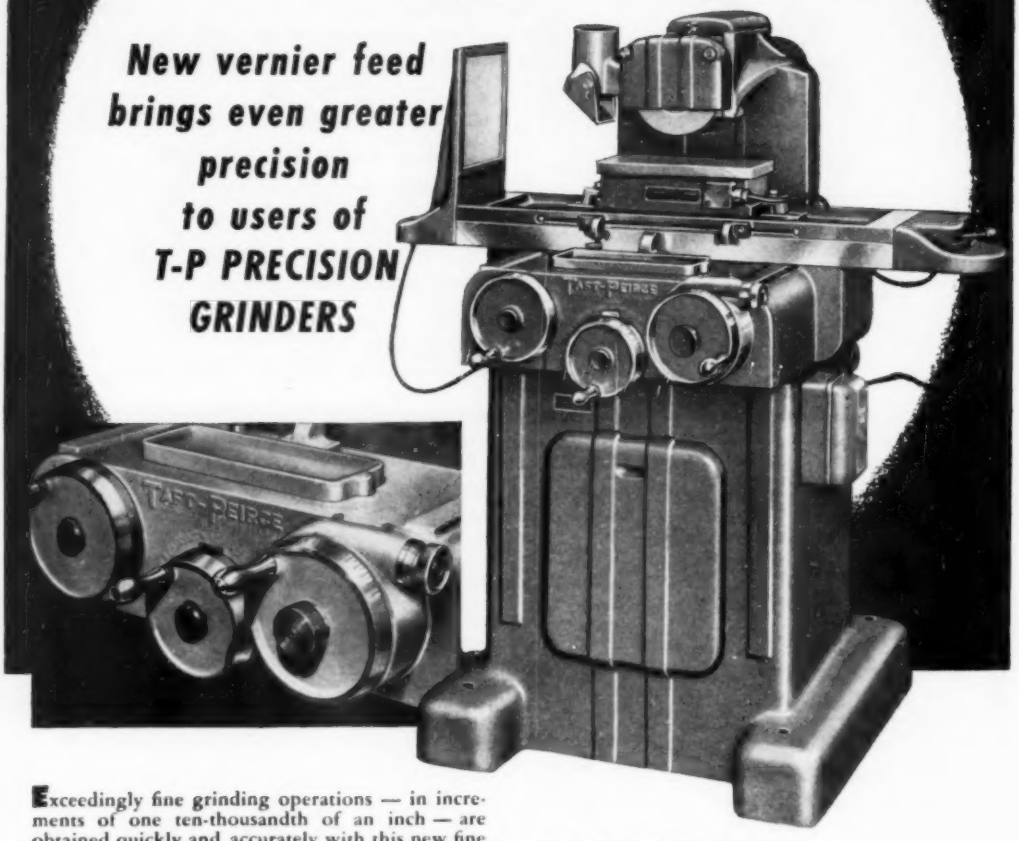

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INDEX OF PRODUCTS ADVERTISED IN THIS ISSUE

Abrasives.....33, 34, 44, 144, 173, 214

Accessories & Attachments (Machine Tool)....24, 50, 51, 56, 232, 254, 272, 274

Bearings.....4th Cover, 212, 241, 258

Books, Technical.....246, 255, 256, 259

Boring, Drilling & Milling Machines (Horizontal) 35, 38-39, 61, 86, 177

Boring Machines Internal.....2nd Cover, 3rd Cover

Boring & Turning Machines (Vertical) 45, 249

Broaching Machines.....66, 155

Brushes 276

Centrifugal Machines 236

Chucks 14-15, 194, 246, 252, 254

Cleaning & Drying Machines & Supplies 171

Collets 14-15

Counters 17

Coolant Systems, Filters & Supplies....165

Cut-Off Machines; Sawing Machines..218, 236, 258

Drafting Room Equipment & Supplies..47

Dressers, Grinding Wheel.....24, 205

Drilling Machines..25, 40, 53, 79, 81, 201, 211, 223, 228, 230, 250, 252, 261

Dust Collectors.....260

Electrical Parts & Equipment...22-23, 41, 55, 75, 179, 181, 202, 207, 225, 234

Electro Plating & Polishing Equipment & Supplies 260

Fasteners 151, 174, 219, 237, 256

Finishing Machines 62

Floor Drying Compounds.....246

Forgings 254

Gages & Instruments..64, 78, 137, 196, 210, 213, 228, 229, 234, 236, 245, 254

Gear Cutting Machines..3, 6-7, 32, 180, 184, 188, 191, 228

Gears, Speed Reducers, Motor Reducers 176, 225, 226, 227

Gear Testers.....3, 6-7

Grinders—Cutter & Tool..12-13, 205, 232, 258

Grinding Machines—Production.....4-5, 12-13, 36-37, 69, 222, 228, 270

Heads: Drilling, Grinding & Tapping...25

Heat Treating Equipment & Supplies..63, 163, 256

Honing Machines.....30-31, 203

Hydraulic & Pneumatic Parts & Equipment..138, 183, 193, 202, 232, 253

Jig Borers 205, 250

Lathes, Automatic.....26-27

Lathes, Engine....20-21, 46, 54, 58, 60, 72, 157, 197

Lathes,Turret.....54, 74, 256

Lubricants, Cutting Fluids, Quenching Oils.....67, 68, 73, 161, 175, 185, 200

Marking Machines & Tools...186, 240, 252

Materials, Cutting & Forming.....178

Materials of Manufacture..18-19, 77, 142, 153, 166, 169, 187, 192, 208, 247, 255, 257

Materials Handling Equipment....195, 216

Mechanical Parts & Equipment..205, 228, 230, 234, 254

Millers, Die Sinkers, Profilers..4-5, 8-9, 46, 199, 238, 249, 274

Polishing & Buffing Machines.....240

Power Transmission.....16, 82

Presses, Forging & Forming Equipment & Supplies..28-29, 42-43, 52, 70-71, 172, 176, 189, 204, 209, 210, 228, 231, 233, 234, 238, 239, 243, 248, 250, 251, 258

Production, Inventory & Tool Control..168

Riveting Machines 252

Rust Preventives 235

Safety & Welfare Equipment.....224

Screw Machines; Chucking Machines..46, 49, 51, 57, 76, 240

Shapers, Slotters, Keyseaters.....88, 228

Special Machine Tools.....202

Stampings 254

Steel Blue 250

Swaging Machines 170

Tapping Attachments 186

Tapping Machines..53, 186, 201, 211, 223, 261

Threading Machines.....10-11, 211

Tooling Set-up Equipment.....254

Tools, Cutting....48, 49, 59, 65, 72A, 72B, 80, 167, 178, 180, 198, 204, 206, 215, 234, 238, 242, 243, 244, 252, 258

Tools, Portable.....167, 182, 190, 217

Vibration Control 140, 250

Welding & Cutting, Brazing & Soldering Equipment & Supplies.....159

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ADVERTISERS INDEX

	Page
Abrasive Machine Tool Co.	228
Acheson Colloids Corp.	185
Acromark Co.	252
Allen Mfg. Co.	174
Allied Products Corp.	219
American Air Filter Co.	260
American Broach & Machine Co.	66
American Magnesium Corp.	77
American Optical Co.	224
American Screw Co.	151
American Steel Foundries Div.	45
American Tool Works	20-21
Armstrong-Blum Mfg. Co.	48
Armstrong Bros. Tool Co.	56
Atlantic Steel Co.	254
Automatic Transportation Co.	195
Axelson Mfg. Co.	197
Barber-Colman Co.	32
Bardons & Oliver Inc.	74
Barrett Co., Leon J.	236
Baumbach Mfg. Co., E. A.	258
Bay State Abrasive Products Co.	214
Beatty Machine & Mfg. Co.	172
Behr-Manning Corp.	173
Bellows Co.	232
Bemis & Call Co., Inc.	238
Bilgram Gear & Machine Co.	226
Black & Decker Mfg. Co.	217
Blanchard Machine Co.	69
Bodine Corp.	223
Bokum Tool Co.	238
Bridgeport Machines Inc.	274
Brown & Sharpe Mfg. Co.	36-37
Bryant Machinery & Engineering Co.	79
Bullard Co.	50, 61
Butterfield Div. of Union Twist Drill Co.	80
Campbell Div. Andrew C., Amer. Chain & Cable Co., Inc.	218
Card Mfg. Co., S. W.	59
Carlton Machine Tool Co.	250
Chambersburg Engineering Co.	189
Chase Brass & Copper Co., Inc.	247
Chicago Latrobe Twist Drill Works Div. United Drill & Tool Corp.	215
Cimcool Div., Cinn. Milling Machine Co.	73
Cincinnati Bickford Tool Co.	81
Cincinnati Gear Co.	226
Cincinnati Grinders Incorporated	5
Cincinnati Lathe & Tool Co.	72
Cincinnati Milling Machine Co.	4
Cincinnati Shaper Co.	88
Cleereman Machine Tool Co.	79
Clemson Bros., Inc.	180
Cleveland Automatic Machine Co.	76
Cleveland Punch & Shear Works Co.	52
Colonial Broach Co.	155
Columbus Die Tool & Machine Co.	228
Cone Automatic Machine Co.	57
Consolidated Machine Tool Corp.	35
Cross Co.	180
Crucible Steel Co. of America	18-19
Curtis Pneumatic Machinery Co.	253
Dake Engine Co.	176
Danly Machine Specialties Inc.	42-43
Davis & Thompson Co.	230
Davis Keyseater Co.	228
Dayton Rogers Mfg. Co.	254
Dearborn Gage Co.	210
Derbyshire Inc., F. W.	256
Detroit Power Screwdriver Co.	230
Diamond Machine Tool Co.	250
Dow Chemical Co.	165
DuMont Corp.	204
Dykem Co.	250
Eagle Picher Sales Co.	246
Eastern Machine Screw Corp.	252
Elmes Engineering Works	209
Elox Corporation	234
Excello Corporation	206
Federal Press Co.	251
Fellows Gear Shaper Co.	6-7
Felters Co.	140
Fosdick Machine Tool Co.	40
Gairing Tool Co.	198
Gallmeyer & Livingston Co.	258
Ganschow Gear Co.	226
General Electric Apparatus Dept.	22-23, 55, 75, 202
Geometric Tool Co.	72B
Giddings & Lewis Machine Tool Co.	53
Gisholt Machine Co.	62
Gleason Works	3
Goss & de Leeuw Machine Co.	240
Grant Mfg. & Machine Co.	252
Greenfield Tap & Die Corp.	72A
Greenlee Brothers	201
Grob Brothers	258
Hamilton Tool Co.	184
Hanchett Magna Lock Corp.	194, 254
Hanna Engineering Works	193
Hannifin Corp.	248
Hanson Van Winkle Munning Inc.	260
Hanson Whitney Machine Co.	213
Hardinge Brothers, Inc.	46
Hartford Special Machinery Co.	261
Heald Machine Co.	2nd Cover
Henry & Wright Div. of Hartford-Empire Co.	231
Hones, Inc., Charles A.	256
Howell Electric Motors Co.	207
Hydraulic Press Mfg. Co.	28-29
Industrial Carbide Tool Co.	178
Ingersoll-Rand Co.	182
International Nickel Co., Inc.	255
J & S Tool Co.	254
Jacobs Mfg. Co.	14-15
Jarvis Co., Charles L.	190
Jones & Lamson Machine Co.	78
Kaukauna Machine Corp.	53
Kearney & Trecker Corp.	38-39
Kent-Owens Machine Co.	199
King Machine Tool	45
Knight Machinery Co., W. B.	249
Korfund Co., Inc.	250
Kux Machine Co.	210
L-W Chuck Co.	236
Landis Machine Co.	10-11
Landis Tool Co.	12-13
Leach Machinery Co., H.	222
LeBlond Machine Tool Co., R. K.	54
Lees-Bradner Co.	188
Leland-Gifford Co.	228
Lewthwaite Machine Co., T. B.	234
Lincoln Electric Co.	159
Lindberg Engineering Co.	63
Link Belt Co.	16

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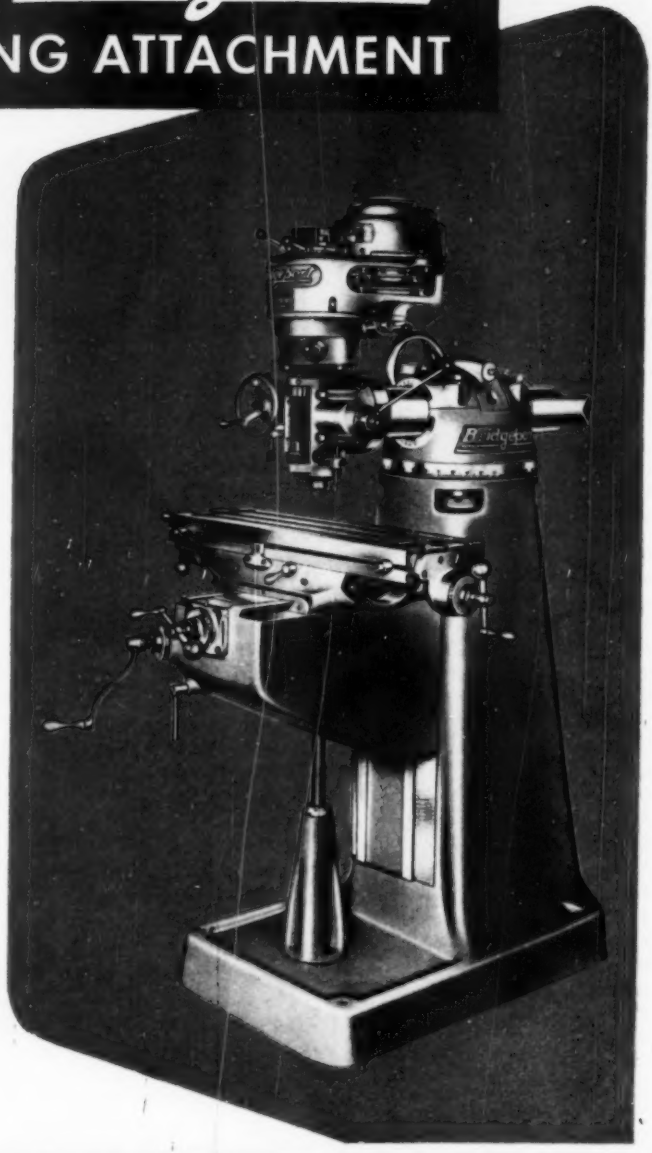

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ADVERTISERS INDEX

	Page
Linley Brothers Co.	250
Littell Machine Co., F. J.	254
Lodge & Shipley Co.	58
Lovejoy Tool Co., Inc.	244
Lucas Machine Division, New Britain Machine Co.	177
Luers, J. Milton	252
Lufkin Rule Co.	245
M & N Machine Tool Works	258
Marlin-Rockwell Corp.	241
McCaskey Register Co.	168
McGraw-Hill Book Co., Inc.	246, 256, 259
Mead Specialties Co.	202
Meisel Press Mfg. Co.	226
Metal Carbides Corp.	243
Micromatic Hone Corp.	203
Monarch Machine Tool Co.	157
Moore Special Tool Co., Inc.	205
Morris Machine Tool Co.	86
Mueller Brass Co.	142
National Acme Co.	49
National Broach & Machine Co.	191
National Machinery Co.	233
Newark Gear Cutting Machine Co.	228
New Britain Gridley Machine Co.	3rd Cover
Niagara Machine & Tool Works	70-71
Noble & Westbrook Mfg. Co.	186
Norton Co.	33, 34, 44
Oakite Products Inc.	171
Ohio Gear Co.	227
Oliver Instrument Co.	232
O'Neil-Irwin Mfg. Co.	204
Ottemiller Co., Wm. H.	256
Ozalid Products Div., General Aniline & Film Corp.	47
Parker-Kalon Corp.	237
Parker Rust Proof Co.	235
Permanente Metals Corp.	257
Philadelphia Gear Works	225
Pittsburgh Plate Glass Co. Brush Div.	276
Potter & Johnston Co. Sub., Pratt & Whitney Div., Niles-Bement-Pond Co.	25
Pratt & Whitney Div., Niles-Bement-Pond Co.	24
Procunier Safety Chuck Co.	186
Production Machine Co.	240
Randall Co., Frank E.	254
Reeves Pulley Co.	82
Republic Steel Corp.	187
Revere Copper & Brass Inc.	153
Reynolds Metals Co.	208
Ryerson & Sons Inc., Joseph T.	166
S.K.F. Industries Inc.	212
Sales Service Machine Tool Co.	234
Scherr Co. Inc., George	234
Schmidt Inc., George T.	240
Schrader's Son, A.	183
Scully-Jones & Co.	272
Severance Tool Industries Inc.	258
Sewall Mfg. Co., E. B.	176
Sheffield Corp.	137
Sheldon Machine Co.	60
Shore Instrument & Mfg. Co. Inc.	228
Sigourney Tool Co.	252
Simonds Abrasive Co.	144
Skilsaw Inc.	167
Smith Corp., A. O.	179
Snow Mfg. Co.	211
Square D Co.	181
Stahl Gear & Machine Co.	226
Standard Gage Co., Inc.	229
Standard Oil Co. (Indiana)	67-68
Stuart Oil Co., D. A.	200
Sunbeam Corp.	163
Sundstrand Machine Tool Co.	26-27
Sunnen Products Co.	30-31
Sun Oil Co.	161
Swiss American Jewel Bearings Co.	258
Taft Peirce Mfg. Co.	270
Threadwell Tap & Die Corp.	242
Tidewater Associated Oil Co.	175
Timken Roller Bearing Co.	4th Cover
Torrington Co.	170
Union Twist Drill Co.	65
V & O Press Co.	258
Van Keuren Co.	64
Van Norman Co.	8-9
Veeder-Root Inc.	17
Verson Allsteel Press Co.	239
Vickers Inc.	138
Victor Saw Works, Inc.	180
Walker Co. Inc., O. S.	246
Waltham Machine Works	238
Ward Steel Co.	169
Warner & Swasey Co.	51
Webber Gage Co.	196
Westinghouse Electric Corp.	41
Wheelock Lovejoy & Co., Inc.	192
Whiton Machine Co.	252
Willeys Carbide Tool Co.	258
Wilson Mechanical Instrument Co.	236
Yale & Towne Manufacturing Co.	216
Zeh & Hahnemann Co.	228

SEARCHLIGHT SECTION
(Classified Advertising)

EMPLOYMENT	Page
Positions Vacant	262
Selling Opportunities Offered	262
Positions Wanted	262
Selling Opportunities Wanted	262
Employment Service	262
SPECIAL SERVICES	
Contract Work	262
General Pattern Works	262
Philbrick Engineering Corp.	262
Woods Sons, T. B.	262
BUSINESS OPPORTUNITIES Offered	262
EQUIPMENT (Used or Surplus New) For Sale	263-269
WANTED Equipment	269

ADVERTISERS INDEX

Aaron Machinery Co.	265
Bennett Machinery Co.	264
Botwinik Bros. of Mass., Inc.	266
Brownell, Hazard Machine Tools, Inc.	264
Brm Machinery Corp.	267
Continental Salvage & Machy. Corp.	267
Davenport, J. P.	267
Dany Machinery Co., D. E.	264
Eastern Machinery Corp.	264
Falk Machinery Co.	263
Ft. Worth Steel & Machy. Co.	262
Hill Clarke Machy. Co.	267
Hyman & Son, Joseph	269
Indianapolis Machy. & Supply Co.	266
Industrial Plants Corp.	268
Kings Co. Machy. Exchange	264
Lafayette Saw & Knife Inc.	269
Marcalus Mfg. Co., Inc.	262
Miles Machy. Co.	265
Morey Machine Co.	266
National Machinery Exchange	267
Osborne & Sexton Machy. Co.	269
Paul's Machinery Co.	264
Rudeloff, O. D.	269
Seaboard Steel Co., Inc.	267
Sier-Bath & Gear Pump Co.	267
Simmons Machine Tool Co.	269
Snow Co., Ferdinand J.	267
West Penn. Machinery Co., Inc.	264
Winston Machinery Co., Inc.	264, 266, 267, 269
Worcester Wire Works	267

"PITTSBURGH" *Power Driven* BRUSHES

A "Pittsburgh" power-driven brush in operation at the Steelcrete Division of Wheeling Steel, Beach Bottom, W. Va. This special brush is on the job every day deburring and cleaning large sheets of Expanded Metal.

On the job for... WHEELING STEEL

Pittsburgh's ingenuity in designing special brushes for unusual jobs is sought time and time again by leading firms in almost every industry. Wheeling Steel, for example, recently put its brushing problem before Pittsburgh's staff of skilled brush engineers.

Selecting a .014 steel wire with pre-tested fast cutting qualities, Pittsburgh engineers designed and built a *Perfect Balance* rotary brush that could take a beating and come right back for more. The brush was *stiff* enough to remove stubborn burrs. It was *tough* enough to penetrate and thoroughly clean the metal. And it was *soft* enough not to impair surface texture.

The brush did the job right from the first day it was put into operation—another example of Pittsburgh's ability to cope with the most difficult brush problems.

There's a "Pittsburgh" Brush for Every Industrial Use!

- GLASS
- STEEL
- PLASTICS
- AUTOMOBILE
- RUBBER
- PAPER
- TIRE and RETREADING
- SHOE MANUFACTURING and REPAIRING

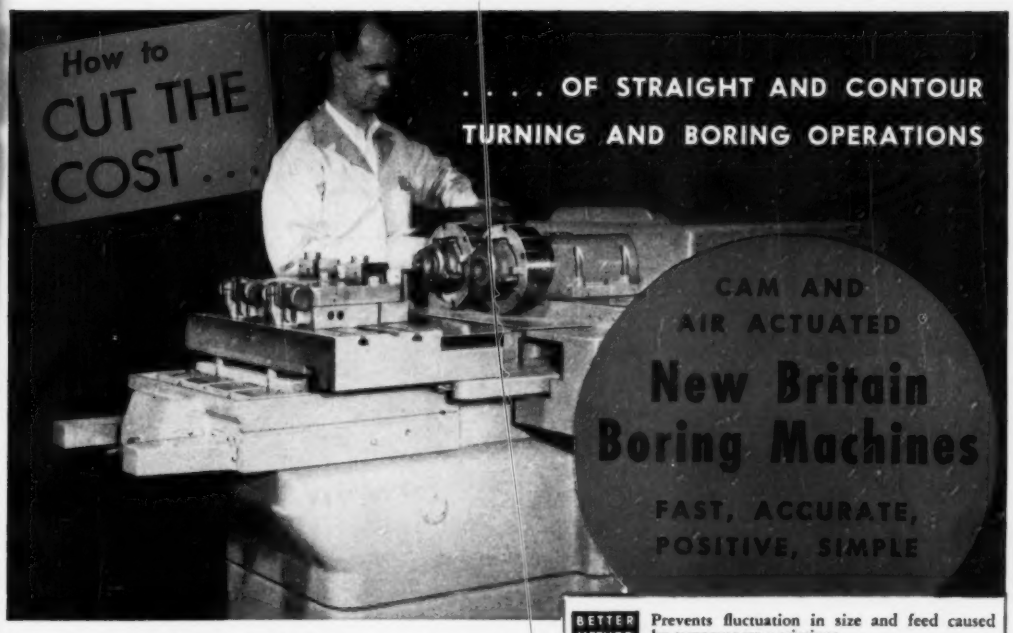
In the complete Pittsburgh line are brushes of all types, including "Perfect Balance" sections, wheels and assemblies. Consult the Pittsburgh engineering representative. He will gladly work with you in developing any type of power-driven brushes to meet your particular finishing specifications.

Phone or write Pittsburgh Plate Glass Company, Brush Division, 3221 Frederick Ave., Baltimore—29, Maryland

Power Driven BRUSHES

BRUSHES · PAINT · GLASS · CHEMICALS · PLASTICS

PITTSBURGH PLATE GLASS COMPANY



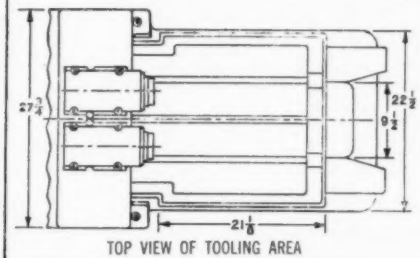
Generate straight bores, outside diameters and an unlimited number of different contours. Adaptable to both roughing and extreme precision finishing of pieces, limited only by the minimum diameter of the boring bar, and on large work by the table size. Operate at top spindle speed of 7500 R.P.M. Two speed drive makes it possible to change spindle speeds for different portions of the same job, to provide for differences in diameters and interrupted cuts.

Available in two sizes of two different models, one for straight boring and turning, the other equipped with contour table. One or more spindles may be mounted, and raised, lowered or spaced as required. Vertical cross slides optional for facing or other cross working operations.

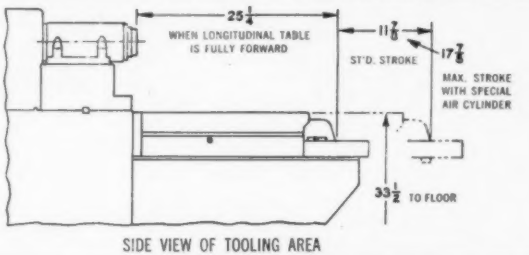
BETTER METHOD	Prevents fluctuation in size and feed caused by temperature variations.
BETTER METHOD	Only one single point tool to buy, set, adjust and grind.
BETTER METHOD	Holds .0001 tolerances by reducing tool strain and work torque.
BETTER METHOD	Positive cam actuation reduces inspection to a single dimension.
BETTER METHOD	Rapid traverse to within a few thousandths of work, quick withdrawal, cut idle time.
BETTER METHOD	Optional automatic loading enables one operator to run more than one machine.
BETTER METHOD	Choice of tool or work rotating set-up makes tooling easy and flexible.

LARGE SIZE TABLE TAKES BIG WORK

Besides doing small work, these machines are capable of mounting large pieces on the tables as shown in the following tooling area sketches



TOP VIEW OF TOOLING AREA



SIDE VIEW OF TOOLING AREA

The work capacity and flexibility of New Britain boring machines open up unlimited possibilities for finding the better production methods on which successful competition stands or falls. Write for full details, and the brochure, "IT CAN BE DONE" which describes actual cost histories on specific jobs.

949MK1

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

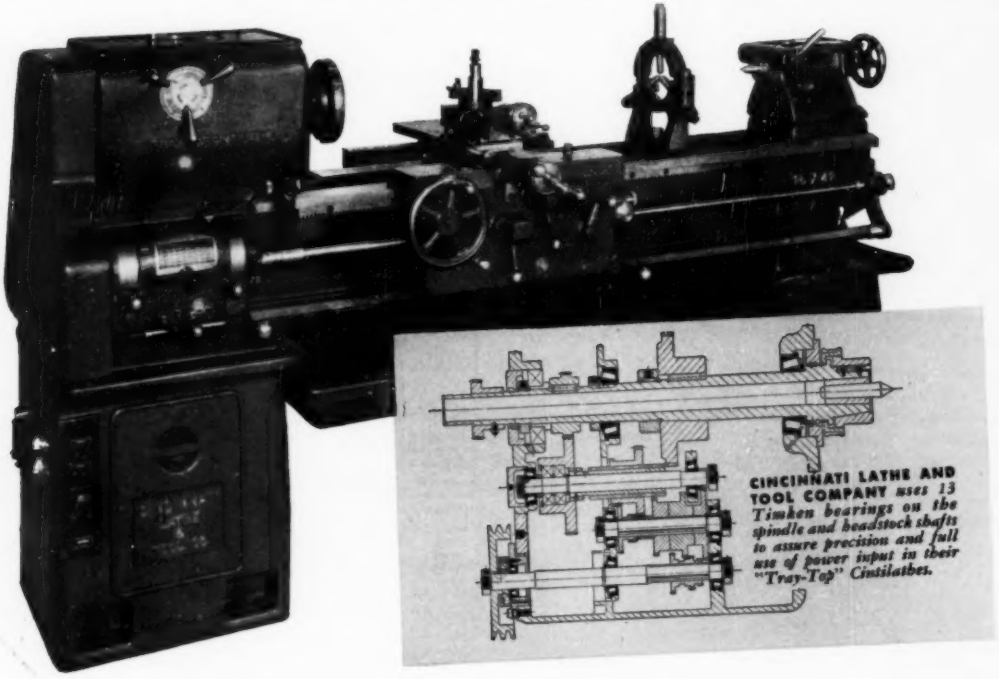
Greater spindle precision—fewer rejected parts with TIMKEN® bearings in the "Tray-Top" Cintilathe

TO keep the spindle rigid and free from chatter and to assure constant precision, the Cincinnati Lathe and Tool Company uses Timken® tapered roller bearings throughout the headstock of their Cintilathe.

Timken bearings keep shafts in positive alignment. Due to their tapered construction, they carry any combination of radial and thrust loads. Manufactured to extreme precision and finished to remarkable smoothness, Timken bearings practically eliminate friction. Full line contact between rolls and races permit maximum load-carrying capacity. And since Timken bearings are made of the finest steel ever developed for tapered roller bearings—Timken fine alloy steel—they last the life of the machine.

With fifty years of bearing research and development behind them, Timken bearings are first choice throughout industry. No other bearing can bring you *all* the advantages you get with Timken tapered roller bearings. Look for the trade-mark "Timken" on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



CINCINNATI LATHE AND TOOL COMPANY *uses 13 Timken bearings on the spindle and headstock shafts to assure precision and full use of power input in their "Tray-Top" Cintilathes.*

NEW TIMKEN BEARING CUTS RUN-OUT IN HALF!

Until now, the Timken "Zero" bearing has been the last word in bearing accuracy. Now Timken offers industry the "Double-Zero" bearing—*twice as accurate* as the "Zero"! Maximum run-out of the new "Double-Zero" bearing is only 75 millionths of an inch—*half* the 150 millionths run-out of the "Zero" bearing.

What an opportunity for manufacturers of machines where extreme accuracy is essential! Available in standard single row types, up to 10" O.D. Write for further information.

TIMKEN

TAPERED ROLLER BEARINGS

TIMKEN 1899 50 YEARS 1949

NOT JUST A BALL · NOT JUST A ROLLER · THE TIMKEN TAPERED ROLLER · BEARING TAKES RADIAL · AND THRUST · LOADS OR ANY COMBINATION